June, 1946 Periodical Vol. 35, No. 6

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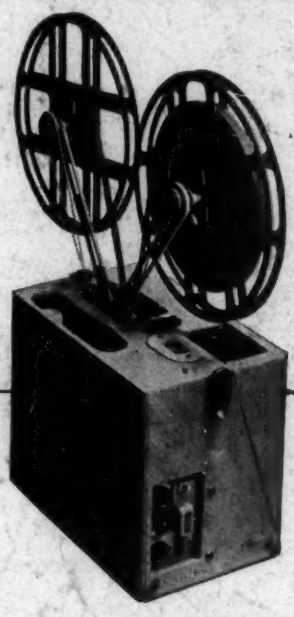
INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

The Shop Teachers' Professional Magazine

It's follow-through that counts



16mm Animatophone Sound Motion Picture Projector

VICTOR'S "after purchase" service means permanent satisfaction

In 16mm Motion Picture Equipment, "follow-through" service is particularly important.

Victor's 23 years experience as a leader in 16mm equipment assures more hours — yes, years — of brilliant operation.

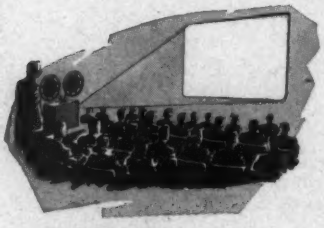
Here is the triple insurance you receive in a Victor:

—Greater availability of service, by factory trained men near you.

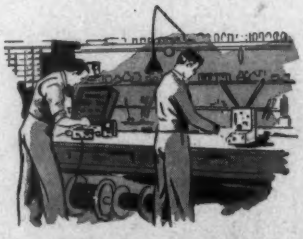
—Faster handling of adjustments or replacements because of Victor simplicity of design.

—More exclusive Victor features that minimize service needs: Safety Film Trip, 180° Swing-Out Lens Mount, Stationary Sound Drum and Offset Film Loop.

Check into this "follow-through" service before buying *any* projector. Write *now* for the complete story of the internationally known Victor Animatophone.



Dependable always . . . with Victor the show goes on!



Service by trained men is readily available.

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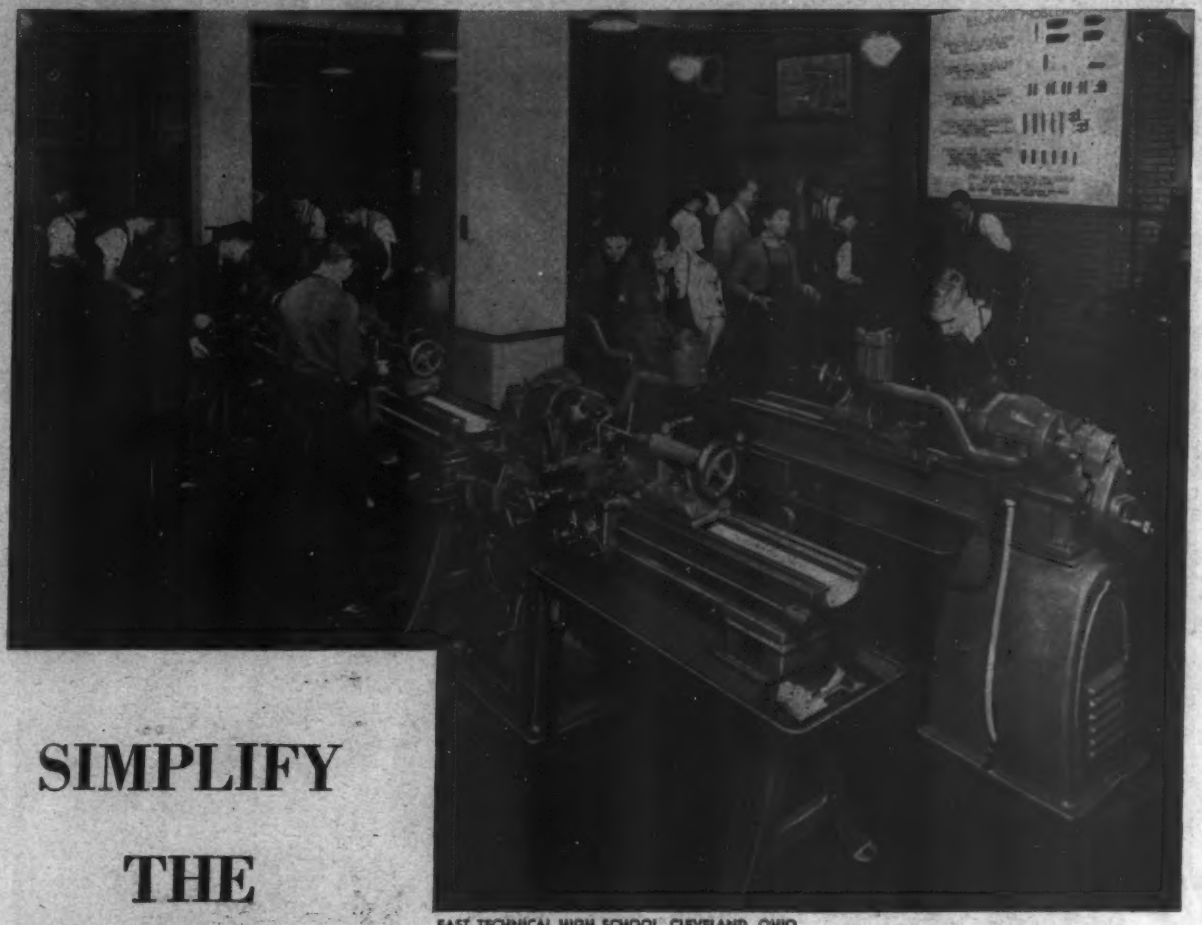
MAKERS OF 16MM EQUIPMENT SINCE 1923

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, June, 1946, Volume 35, No. 6. Published monthly, except during July and August, by The Bruce Publishing Co., Milwaukee 1, Wis. Entered as Second-Class Matter January 2, 1914, at the Post Office at Milwaukee 1, Wis., under the act of March 3, 1879. Subscription price in the U. S., Canada, and countries of the Pan-American Union, $2.50 per year; Foreign, $3.00; Single copies, 35 cents.



EAST TECHNICAL HIGH SCHOOL, CLEVELAND, OHIO

SIMPLIFY THE TEACHING OF MODERN SHOP PRACTICES WITH SOUTH BEND LATHES

The easiest and simplest way to teach modern shop techniques is with modern shop equipment. New methods, new materials and new precision came out of the war. Manufacturers learned to work to unprecedented degrees of accuracy; necessity forced the development of dozens of new materials—metals, alloys, and plastics. These new materials, improved methods and higher precision standards are here to stay.

The vocational student today must be trained according to the trends of the times. The problems of training are greatly simplified by using equipment that meets these new, more rigid requirements. That's why more and more schools everywhere are choosing modern South Bend Precision Lathes for teaching today's methods with today's materials.

***Send for this catalog*—Write today for Catalog 100-D which shows, in full color, all types, sizes and models of South Bend Precision Lathes. South Bend Lathes are made with 9-inch, 10-inch, 13-inch, 14½-inch, and 16-inch swings, and bed lengths to 12'. The complete line of South Bend attachments and accessories also is shown.**

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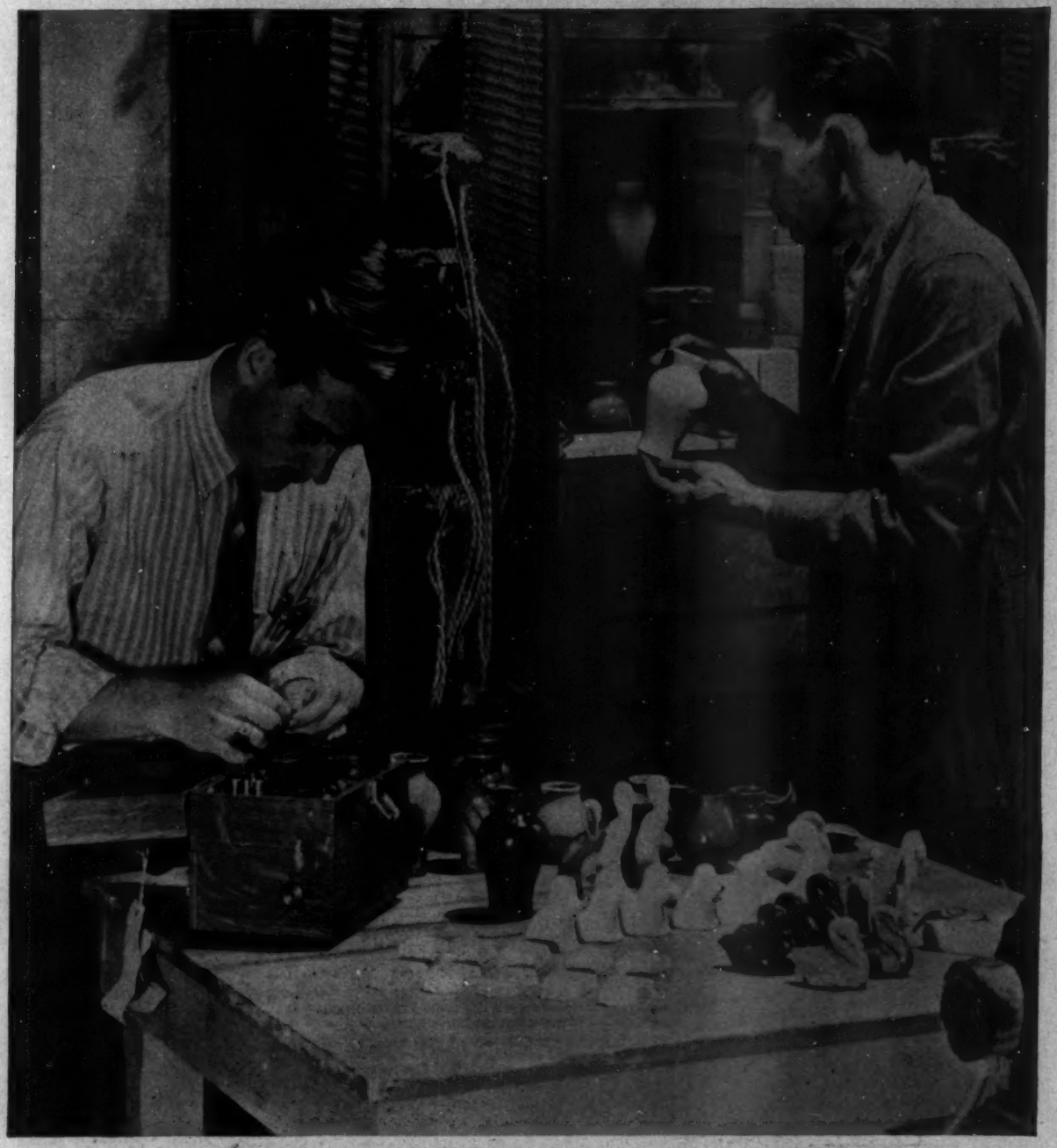

Installation with GLOBAR Elements at Iowa State College

Iowa State College, like other leading educational institutions, must have modern facilities to insure their students training in the very latest methods. Electric kilns are no novelty at Iowa State, in fact the kiln illustrated has been in service several years.

Technologists Needed

"Convenient method makes Ceramic instruction practical for intermediate schools in meeting training demands."

Observes C. M. Dodd, Head, Department of Ceramic Engineering Iowa State College of Agriculture and Mechanical Art

Now modern compact electric kilns, equipped with Globar non-metallic heating elements, make ceramic instruction, demonstration and shop practice simple and practical. Noise, dirt, fumes and explosion dangers, associated with complicated fuel fired equipment, have been eliminated. Take Mr. Dodd's experience at Iowa State College as an example.

Here—with very little instruction, any engineering student can be taught to operate a furnace equipped with GLOBAR heating elements satisfactorily. Radiated heat makes saggers unnecessary. Oxidizing atmosphere is assured during critical periods of firing. Economical and flexible for firing small quantities of glazed ware, the furnace is convenient for glaze studies, whiteware body studies, refractory ware studies, and firing behavior tests on clays. It can be set up wherever the proper electric current is available.

In any installation—absolute safety to students, instructors and school property is assured by simple operation and positive control. Not limited to ceramic applications alone, GLOBAR elements are ideal for forging and heat treating as well as a variety of chemical laboratory uses. They are particularly adaptable to intermediate vocational school requirements. For more detailed information and data, inquire from The Carborundum Company, Globar Division, Niagara Falls, New York.

GLOBAR Heating Elements
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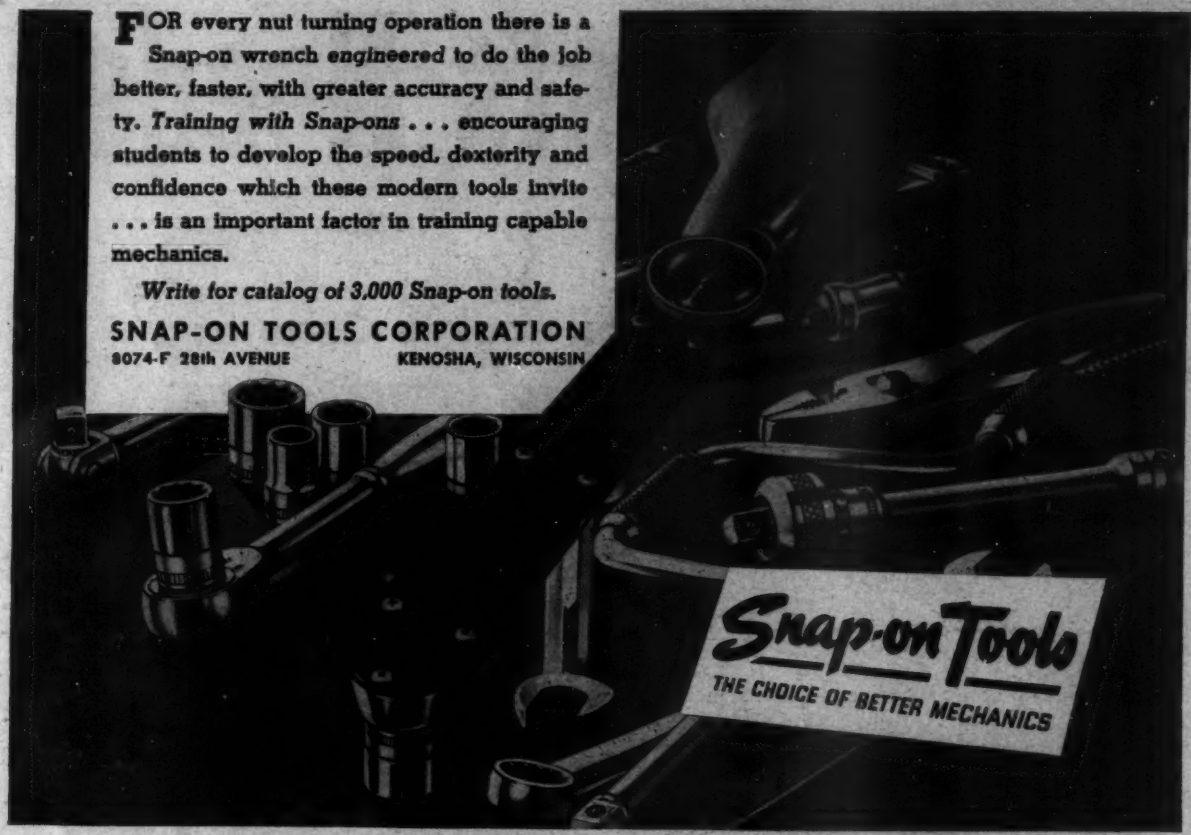
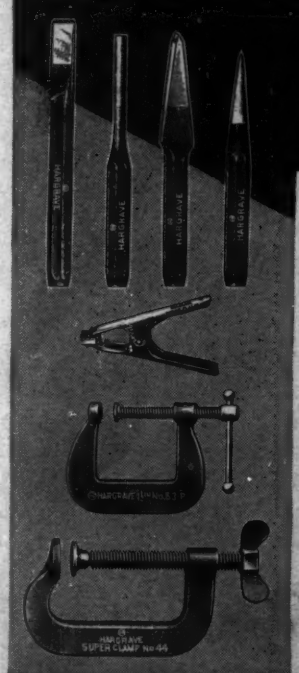


TIPS You Can Trust

HARGRAVE TESTED TOOLS



Here are some swell tips you can rely on — Hargrave Chisels and Punches. These famous tools are Individually Tested for Hardness and Toughness. As a result, they're rugged enough to give lasting service despite toughest use. These Hargrave Tools are made from special analysis steel, trip-hammer forged (not drop-forged). Each tool is properly balanced and proportioned. And there is a Chisel and Punch for every job.

Also illustrated are Hargrave Improved Spring Clamp, Super Junior Forged Steel Clamp, No. 44 Forged Steel Super Clamp. All Hargrave Clamps are Individually Tested. Sizes range from ¾" to 10' openings, from ½" to 16" deep.

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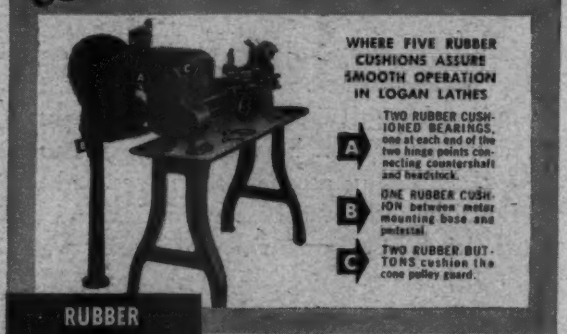
Logan A NAME TO REMEMBER WHEN YOU THINK OF **BETTER** LATHES


WHERE FIVE RUBBER CUSHIONS ASSURE SMOOTH OPERATION IN LOGAN LATHES
A TWO RUBBER CUSHIONED BEARINGS, one at each end of the two hinge points connecting countershaft and headstock.
B ONE RUBBER CUSHION between motor mounting base and pedestal
C TWO RUBBER BUTTONS cushion the cone pulley guard.

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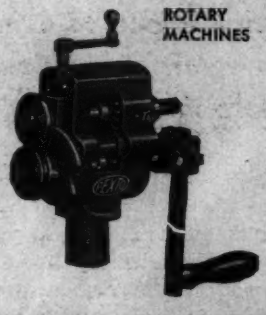

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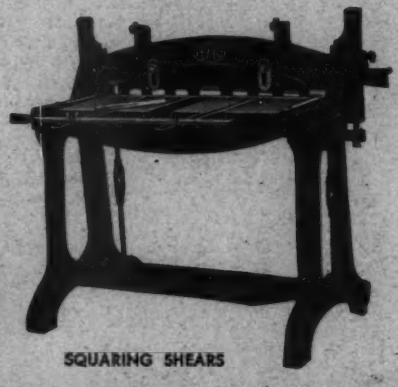

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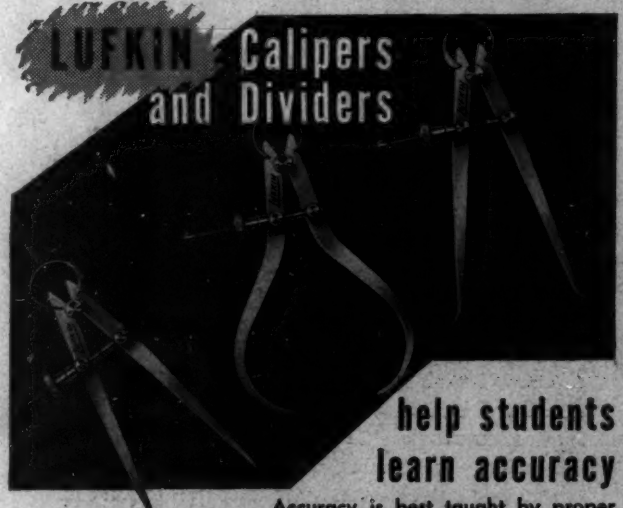

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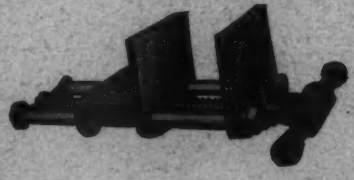

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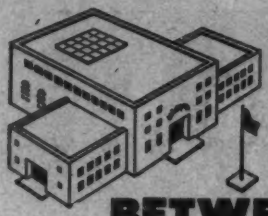
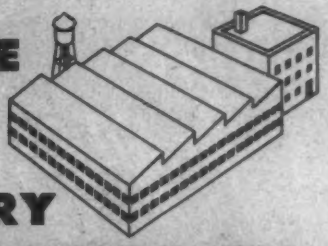


THE SHORTEST DISTANCE

BETWEEN SCHOOL AND FACTORY



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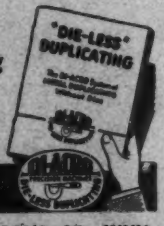

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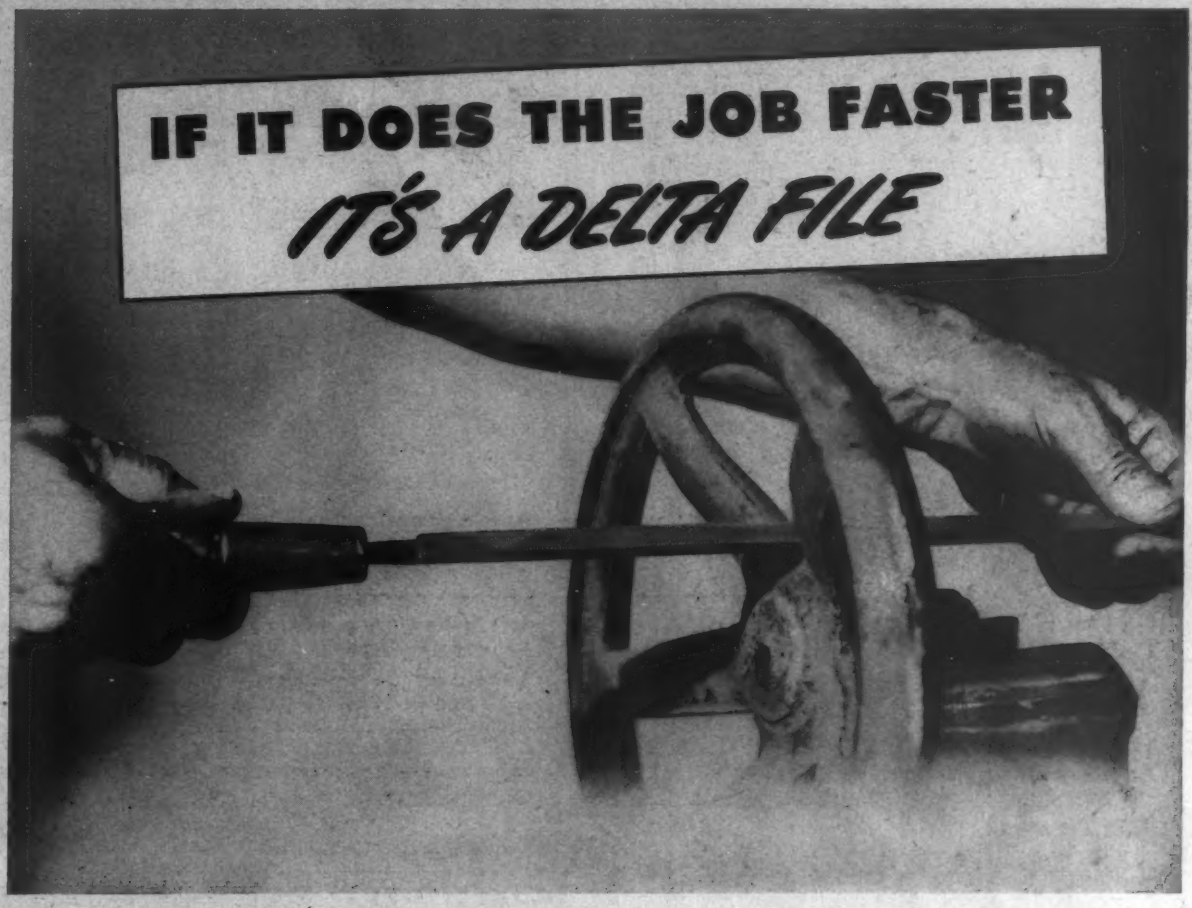

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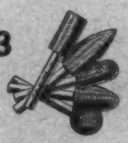
3 
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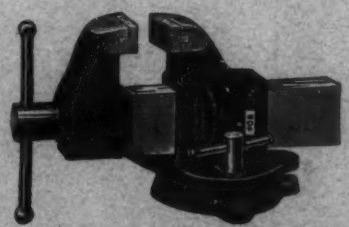

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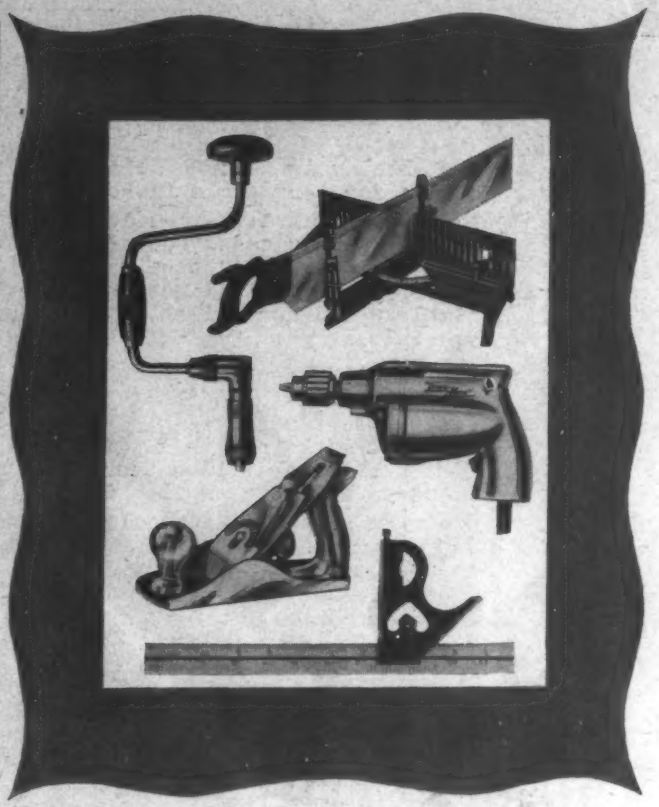

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Case History No. 187

Ebaloy is a tough alloy steel. "LALF" stands for Long Angle Lathe File. The two came to grips in a valve-manufacturing plant. In perhaps ninety cases out of a hundred this file will do a perfect job of lathe filing. But in this particular instance it didn't . . . it simply would not polish out Ebaloy valve stems smoothly.

A Nicholson service engineer had the solution. One way to do the job right, he explained, was to use the Long Angle Lathe File to remove the tool marks and then polish with a Mill Smooth File. A still better way, said he, was to use a Mill Second Cut* for the whole operation . . . because it could do a faster cutting job and at the same time produce a perfectly satisfactory finish.

THE CARE OF EBALOY VS. "LALF"

New metals, new products, new production methods are constantly creating new filing problems. It has long been the Nicholson policy to serve industry not only by making *Files for every purpose*, but to assist in selecting *The right File for the job.*

In the course of their calls on industrial plants, Nicholson field men uncover many new situations that add valuably to the vast store of information which has made Nicholson one of the world's most widely recognized authorities on files and filing.

Case histories like the above are typical "nuggets of information." They offer good class and shop subjects for the training-school instructor. Make use of this one when the theme for the day is on machining alloys — and Ebaloy in particular.

Further educational discourses of this type are contemplated for future Nicholson advertisements.

How is your classroom and library supply of "FILE FILOSOPHY" — the Nicholson 48-page handbook on kinds, use and care of files? It's FREE. Tell us your needs.

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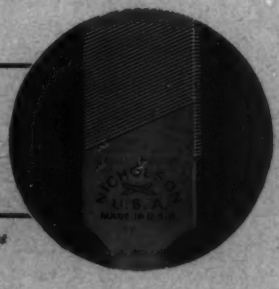
FOR EVERY PURPOSE



*Nicholson Mill Second Cut

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Glory be — this vacation may be a real happy one again. There may be travel restrictions because of strikes or other causes, but the war, at least, will not interfere with our enjoyment of an old-time vacation program.

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Please! Please! Please!

The paper shortage makes it necessary to keep our press runs as low as possible. Will you, therefore, help us help you and the rest of our readers by notifying us immediately of any change in your mailing address. Unless this is done, your copy of the magazine may go astray, and we will be unable to replace it.

All we need is a post card from you on which your old address, and your new *permanent* fall address is given. Don't forget to give us your zone number if your location requires one.

Additional Conventions

June 13–15. National Graphic Arts Education Association at Philadelphia, Pa. Fred J. Hartman, Educational Director, 719 Fifteenth St. N.W., Washington, D. C.

July 6. Educational Press Association of America at Buffalo, N. Y. William D. Boutwell, secretary, 220 W. 42nd St., New York 17, N. Y. Headquarters, Hotel Statler.

July 23–25. American Teachers Association at Durham, N. C. Dr. H. Councill Trenholm, secretary, P.O. Box 271, Montgomery 1, Ala. Headquarters, North Carolina College for Negroes. Exhibits in charge of Dean Albert L. Turner.

August 5–7. National Association of Visual Education Dealers at Chicago, Ill. Don White, executive secretary, 431 S. Dearborn St., Chicago 3, Ill. Headquarters, Continental Hotel. Exhibits.

August 10–15. American Occupational Therapy Association at Chicago, Ill. Mrs. Meta R. Cobb, secretary, 33 West 42nd St., New York City. Headquarters, Congress Hotel.

August 21–28. Air Age Education Research Congress at New York, N. Y. Dr. N. L. Engelhardt, Jr., director, 100 East 42nd St., New York 17, N. Y.

This Month's Cover

The picture chosen for the cover of the June issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION shows a diemaker machining the cavity of a die mounted on the faceplate of a lathe. Photograph, courtesy of The South Bend Lathe Works, South Bend, Ind.

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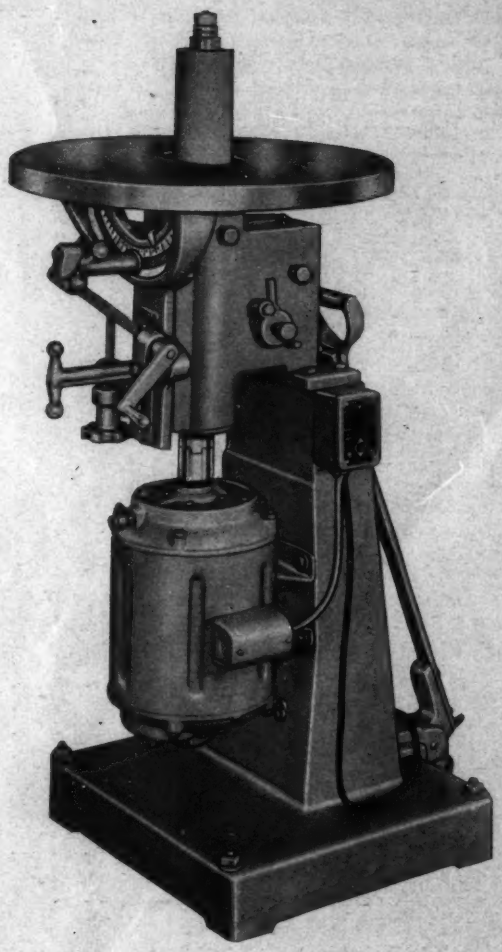

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Basic Assumptions*

*Homer J. Smith***

General Types

Democracy in education requires not only broad offerings but flexibility in their administration. It necessitates wage-earning preparatory possibilities in a coeducational and cosmopolitan atmosphere. It assumes initial training for all types of people and for all types of positions and jobs, plus continued assistance during working years for youth and adults.

The public must be informed about and helped to differentiate among the varied courses, services, and procedures offered by their schools.

We have become a highly mobile people. Any community must accept the facts that it provides training to persons who will use it elsewhere and that it profits, in turn, from the programs of other communities.

Education must make constant advance toward full-year activity with increased use of plant and facilities each day and month.

Retention of enrollees at the secondary level is enhanced by good home and school morale; school leaving is more social than economic as to cause.

More young people will attend high school and a greater percentage of these will attain graduation. More and more of the latter will desire to pursue additional formal courses in the home city or at distant institutions. Adult offerings of many types, both academic and nonacademic, with and without credit, will rise in popularity or demand. We may anticipate larger enrollments in industrial arts and trade training, both day and evening.

All occupations, major and minor, have teachable content although there is great variety as to amounts and the consequent lengths of teaching or learning periods required.

Co-operative earn-learn arrangements, properly organized and supervised, constitute the best possible means of preparation for specific employments. These agreements should be representative of a wide range of occupations.

No postwar date can be recognized, only a gradually heightening responsibility of the schools. Each war service person who returns and each industrial worker who transfers must be counseled, instructed, and adjusted when his problem appears. Each employer must be assisted in war production, during his conversion to peacetime manufacture and at all times of need thereafter.

State and federal money grants or reimbursements are assumed to be encouragement (aid) rather than support. They should not lessen local initiative and effort to provide the best possible offering. They should not unduly influence the pattern of the local program if it has been factually and wisely planned.

Vocational guidance and vocational education are not only interdependent; they are mutually causal. Guidance, preparation, placement, follow-up, and continuous adjustment can be functional services only when well integrated. More attention should be paid to the size and nature of a community when planning a training program than when considering the full scope of the counseling work.

Administration and supervision, *in toto* and in all subject areas, are overlapping responsibilities. They tend to be more closely interwoven in the so-called "practical areas." Principals find it easier to assist instructors in general subjects.

Administrative planning and provision must be in terms of groups to be served, if counselors and instructors are to effect the more certain and more convenient adjustment of individual enrollees.

Industrial Education As a Whole

Good industrial education is good economics, good sociology, and good democracy as well as good education.

Every person, young or old, male or female, can profit by some form of industrial-arts and crafts instruction; as to trade preparation and upgrading, many persons will fail to get work, to remain employable or to make worthy progress without them.

Industrial-arts and vocational-industrial education are unlike yet they have common elements and must be integrated. The former cannot be made too general and the latter cannot be made too specific. In both phases, variety of offering and procedure are requisite to good enrollment and high retention.

Field objectives range through acquaintance, exploration, training, upgrading and adjustment of enrollees, plus allied services to employers of industrial workers. Such differentiations must become more clear-cut in the thinking of all concerned. Industrial courses in any school should be studiously matched with the purpose and responsibility of such school.

We must place more general materials in all industrial courses if we are to expect increasingly worthy outcomes. We must make fuller use of the academic content which is an actual and necessary part of the trades sampled or taught. Pupils of trade inclination must not be denied access to liberal amounts of general courses under convenient scheduling. Library facilities must be increased in amount and kept fresh and of easy access. Information of three kinds — necessary, broadening, guidance — must be standard parts of every course, subject only to changed emphasis according to types and levels.

Versatility tends to supersede specialization as a desirable attainment for about three fourths of the industrial workers. This suggests broad industrial-arts offerings and broader base building in trade areas before deepening in single trades or parts thereof is attempted.

Trade education should be based largely upon local earning opportunities but industrial-arts offerings, being more exploratory, should be less narrowly based.

School shops and workrooms should be more like laboratories than like production places, because a school is not a factory. This concept is not in conflict with the ideals of practicality and high performance in this field.

Vacation employments of school youth may well be supervised, and to a certain extent controlled, to render them of use in exploration and preparation as well as for immediate earning.

War conditions should not be permitted to affect school offerings and practices longer than necessary. We have learned much while participating in the enormous and effective war production training program, yet this type of instruction will not develop the competent and dependable tradesmen who will be in unusual demand after the war.

There is always a group of early leavers in every high or

---

*This article is a part of a tentative report submitted to the board of education of Battle Creek, Mich., on a comprehensive survey made of the public school system of that city. The study was made in 1944 and 1945 by The Committee on Field Services, Department of Education, University of Chicago. The survey staff consisted of 38 — half of whom were professionally employed outside the University of Chicago.

Dr. Homer J. Smith, who had the responsibility of reporting upon all phases and relationships of industrial education, listed the basic assumptions contained in this article as an aid to himself in conducting his part of the survey. It is felt, however, that the material will be equally helpful and interesting to many readers of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION.

This first appearance in printed form is through the courtesy of Dr. Ralph E. Tyler, professor of education, and chairman of the Department of Education, University of Chicago.

**Professor of Industrial Education, University of Minnesota, Minneapolis, Minn.

vocational school. If identified, many of these individuals may be encouraged to remain longer than they have intended. The sure-to-go-soon individuals may as well be grouped for special courses and types of content more closely matching placement needs, with the usual requirements of schools and curriculums waived completely in deference to better work-life adjustments.

Dropouts and graduates of both industrial arts and trade kinds should be subject to the follow-up and adjustment policies and activities of the school.

Industrial-Arts Courses

There may well be variation among schools as to instructional units and media, but within a standard city pattern of offerings by grades or half grades below the tenth.

This phase of industrial education calls for the widest possible variety of equipment, supplies, operations and processes, teaching techniques, learning assignments, and evaluation procedures.

Industrial-arts courses gradually attract girl enrollments and should become constants in some amount for all pupils of junior high school ages.

The purposes of this work are pupil broadening, self-expression, self-exploration and, to a less extent, preparation for more specialized courses of industrial and technical type. The shop or classroom atmosphere should be one of busy, joyous activity and inquiry.

Having a class begin a basic trade and carry on to the extent of their abilities and allotted time does not constitute the giving of an exploratory industrial-arts course.

Standards of performance in industrial arts should be pupil standards and teacher acceptance standards, both of which will vary. Trade standards should be determined and fully met in trade preparatory and extention classes.

Industrial-arts instructors should be institutionally and broadly prepared. They should be skillful in the early elements of several trade types and especially well informed about mechanical and scientific processes and materials. Work experience is a strong asset rather than a professional necessity.

Costs for supplies should not be permitted to inhibit pupil selection of projects nor to limit instructors in the planning of assignments.

Evening recreational courses for nonindustrial adults should prove very attractive after the war. Interest will be born of the inherent urge to manipulate, more leisure hours and less fatigue, interim war contracts with industry, broader marketing of craft books and journals as well as more home workshops and special equipments for them. Such courses will insure better use of school facilities, higher total earnings by teachers, patron support of an enlarging curriculum, and sale of more consumer goods to schools and homes.

Vocational-Industrial Courses

Continuous vocational education survey processes are necessary for knowledge of needed types of training and for the matching of quotas.

Occupational analysis processes must be employed in order to identify worthy content and to keep it in practical revision.

The needs of small employers, and of employees who work alone or in small firms, should receive more and increasing attention from the schools.

An effective program cannot be developed except through the earnest and active co-operation of schools, employers, and workmen. Major planks in this platform of unity are advisory committees, relations with apprenticeship, job specifications and employer reactions, on-call members of the teaching corps, and some school classes held in outside work places.

The related and technical aspects of industrial occupations become increasingly important. They should be stressed equally with skills in day preparatory courses and should take precedence in evening and other adjustment types of classes.

Excellent conditions result from continuous school interest in locating groups to be served and in learning their specific needs. Attempts to match pay-roll names, with their requisite skills and knowleges, are more fruitful than general attempts to help needy persons in broad trade fields.

An efficient industrial co-ordinator, with power and time to act, is the real key to a growing and defensible training program. For locating needy groups and making the training effective, the contacts of such an official are more valuable than formal surveys and analyses.

Standards of performance must be occupational earning standards, whatever they may be, and must include quality of workmanship, accuracy and speed plus problem solving ability and judgment. This is the reason why competent craftsmen are employed as instructors.

Day preparatory instruction should be given in long terms while evening extension and part-time training should be offered in brief units or courses.

The spiral method of presentation and management is appropriate for long-term preparatory courses. Under this method learners may be assigned to machines or processes in continuous rotation and thus brought to their limits of perfection broadly and gradually. The block method is more appropriate for brief unit courses of upgrading type, for minor-job training and for early-leaving groups. Under this method each learner is brought to the highest possible earning usefulness on a few machines or within a narrow range of operations or processes.

Better trade preparation would result if learners were given periods in the several occupations of which a trade area is comprised before concentrating on their specialties. For example, a young man might approach the machine-shop training program with a background of courses in mechanical drafting, pattern-making, and foundry practice. This arrangement is predicted upon better than present selection of trade enrollees.

Postwar High-School Electricity

*T. G. Wilcox**

The advent of high-school electricity courses on a larger scale has suggested that there is a greater need and that more is being offered. While the war provided the greatest need, 1941 lists showed 122 colleges and universities offering technical and nontechnical[1] radio courses.

At the conclusion of World War I, the trend seemed to be to offer electricity in the form of theory and laboratory courses.[2, 3]

But in the early 1920's the effect of specialization in industry brought electricity into the school shops to a greater extent. When the outlines for the pre-induction electrical courses were issued by the government in World War II many school curriculums required very little change.

The outline given herewith is based on the experiences obtained in a one-teacher shop of a four-year high school. The general outline has both industrial arts and vocational aspects, because broad basic courses taper into specialization.

The general industrial-arts objectives of developing manual ability in the use of

*High School, Freeport, Ill.

[1]"Your Career in Radio," Carlisle and Rice.

[2]"A Course in Practical Electricity," Bealer, *Industrial Arts Magazine*, August, 1922, p. 309.

[3]"The Electrical Department in a Comprehensive High School," Crofoot, *Industrial Arts Magazine*, April, 1921, p. 138.

common tools that will help the pupil in his daily activities, of increasing knowledge of industrial products and processes, of providing an opportunity for creating expression through the medium of tools and materials, and of motivating interest in an increasing knowledge of the fields of industry, and the occupational opportunities related thereto are applied to the basic courses.[4] The general vocational objectives including the ability to do definite jobs specified in the different employment levels, the ability to understand the facts and principles that condition the jobs, and the ability to understand and appreciate the industrial relations that effect the job are applied to the specialization courses. This is practical because, upon completion of trade training, the student going into the electrical field that is controlled by unions can, at most, only become an advanced apprentice.[5]

Examination of the diagram of classes will show the organization of industrial electricity courses which are primarily designed for the noncollege student. The classwork is set up in such a way that approximately 60 per cent of the total time is applied to processes, and 40 per cent to related lesson topics with references in the classroom made only to the shop work. The organization of the courses of study is such that Part I gives the class objectives, II the learning processes, and III the "doing" processes with further breakdown into specific jobs or the student's choice of comparable projects. Each student is given a copy of the course of study as given here as well as lists of projects, jobs, and required work when he starts the course. The courses of study follow:

Electro Mechanics I

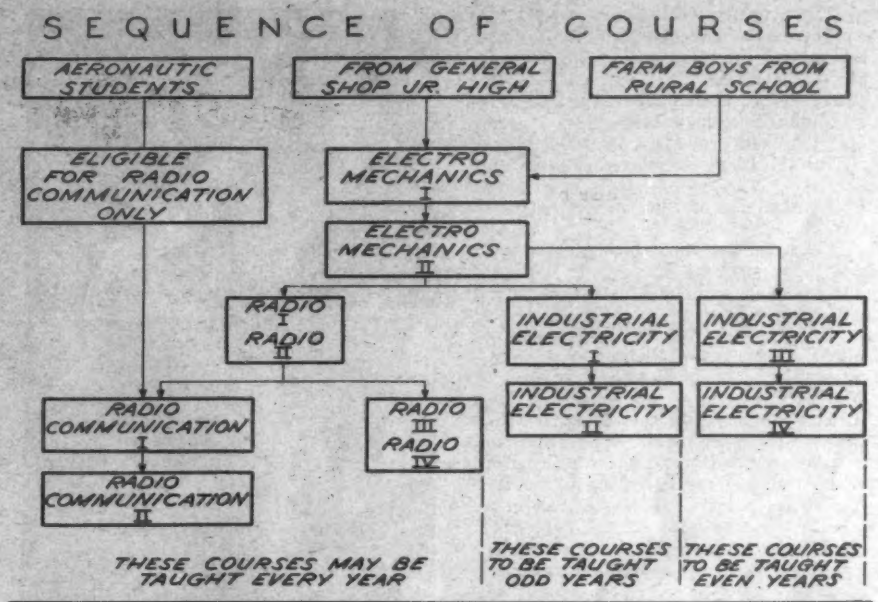
Preinduction Fundamentals of Electricity

Text: "Fundamentals of Electricity," by Johnson and Newkirk[6]

I. The major objectives of this course are to develop manipulative skills, a knowledge of procedure and construction, processes, a knowledge of the qualities and characteristics of materials, and habits of co-operation.

II. Study and discussion of the following topics will form the basis for the course and will serve as "things the student should know."

a) How to splice, solder, and tape
b) Magnetism — what is it
c) The structure of matter and the electron theory
d) The primary cell and electromotive force
e) The storage battery
f) Voltage, current, and resistance
g) Electromagnetism
h) Meters
i) Heating effects of the electric current
j) Work, energy, and power
k) Induced electromotive force
l) Motors
m) Mutual and self-induction



n) Rectification of current

Demonstrations and experiments will be performed relating to each of the foregoing topics

III. The following outline of jobs gives the student a working knowledge of parts, equipment, and methods, and they act as a list of the "doing processes."

a) Splicing, soldering, and taping
b) Making magnets
c) Wiring elementary circuits
d) Wiring relays and their applications
e) Construction of a simple cell
f) Connecting cells in series and parallel
g) Wiring a telegraph circuit
h) Calculating and measuring electrical values
i) Wiring open and closed circuit switches
j) Connecting series and parallel circuits
k) Construction of a simple motor
l) Construction of a 118-Z 6 rectifier or a copper oxide rectifier

IV. Tests will be given regularly to determine the students' progress.

Electro Mechanics II

Electrical Wiring

Text: None

I. This is a course in house wiring, and training is given in telegraph and telephone wiring. A study of the occupational opportunities in these fields also is made.

II. Things the student should know.

a) Blueprint reading of house wiring and signal circuits
b) Basic devices and circuits
c) Types and sizes of wire
d) Wiring methods
e) Farm wiring
f) Amount and types of lighting
g) Wiring for motors
h) Electric signs
i) Types and functions of keys, sounders, and relays
j) Direct and alternating currents in telephones
k) Telephone transmitters, receivers, and sets
l) Manual telephone systems
m) Dial telephone systems

III. Jobs and projects

a) Reading blueprints
b) Identification of parts and wiring simple circuits
c) Classification of types and sizes of wire
d) Conduit bending, and running conduit or raceway
e) Wiring switches
f) Wiring a fluorescent unit
g) Connection of motors through switch boxes to proper fuse box
h) Wiring script and chaser effects
i) Wiring telegraph circuits
j) Assembly and tests of telephone parts
k and *l*) Run, route, and connect telephone circuits
m) Installation and operation of simple switchboards

IV. The first nine weeks of this course will cover electrical wiring, the later part telegraph and telephone wiring.

Radio I. Elements of Radio

Text: "Elements of Radio" by Horton-Marcus[7]

I. This is a basic training course for developing the operational skills for radio jobs, stressing the fundamentals, and bringing out appreciations, aims, and attitudes which fulfill the industrial-arts basic objectives.

II. Things the student should know.

a) History of communication and wave motion
b) Waves in ether
c) A simple radio receiving set
d) The aerial ground system
e) The tuner
f) The reproducer
g) The detector
h) Wave form
i) The antenna coupler
j) Electron flow in the aerial-ground circuit
k) Electron flow in the tuning circuit
l) Electron flow in the crystal detector and phones
m) The vacuum tube detector — the triode
n) The vacuum tube detector — the diode
o) The regenerative detector
p) The audio-frequency amplifier
q) Eliminating the *A* battery
r) Eliminating the *B* battery
s) Eliminating the *C* battery
t) The a.c.-d.c. power supply

[4] "Industrial Arts Course in General Electricity for the Junior High School," Collar, *Industrial Arts and Vocational Education*, March, 1944, p. 113.

[5] "Vocational Electrical Training," Mark McMillin, *Industrial Arts and Vocational Education*, June, 1944, p. 248.

[6] The Macmillan Co., New York City.

[7] Prentice-Hall, Inc., New York City.

u) The dynamic speaker
v) The radio-frequency amplifier
w) Volume controls
x) Tone controls
y) Types of vacuum tubes
z) Radio direction finders

III. Jobs and projects

a) Identification of radio parts and symbols
b) Construction of regenerative battery receiver kits
c) Construction and tracing circuits in power supplies
d) Designing and construction of an assigned type of detector
e) Blocking out receiver diagrams

Radio II. Elements of Radio

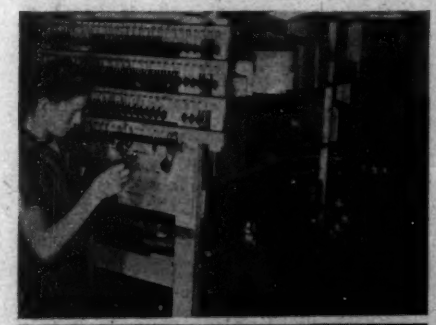
Text: "Elements of Radio," by Horton-Marcus[8]

I. This is a semester course of basic radio training for developing the operational skills for radio jobs and giving the student prevocational training, supplementing Radio I.

II. Things the student should know.

a) The superheterodyne
b) Direct current
c) Magnetism, motors, and measuring instruments
d) Alternating currents
e) Inductance, inductive reactance, and impedance

[8]Prentice-Hall, Inc., New York City.



Upper: Toolroom. Middle: Radio I—soldering TRF receiver. Lower: Radio II—Construction of super heterodyne

Upper: Radio communications I—code practice. Lower: Radio communications II—handling of receivers

f) Capacitance
g) Resonant circuits and tuning principles
h) The electromagnetic wave
i) Radio antennas for transmitters
j) Vacuum tube oscillators
k) Vacuum tube amplifiers
l) The continuous wave transmitters
m) The modulated wave transmitter
n) The cathode ray tube and its applications

III. Jobs and Projects

a) Construction of a superheterodyne receiver
b) Construction and calibration of a parts tester
c) Planning and constructing an AF or RF oscillator

Radio III. Basic Electronics and Electrical Measurements.

Text: "RCA Tube Manual,"[9] "The Radio Amateurs Handbook," and "How Electronic Tubes Work."

I. The objectives of this course are to study the fundamentals of electronics, to apply tubes to control electrons, to measure and test parts, and to care for measuring equipment.

II. Things the student should know.

a) Basic parts of tubes and their functions
b) Tubes and their characteristics
c) Tube actions, gas filled and high vacuum
d) Functions of different types of tubes: (1) the Kenotrone, (2) the Pilotron, (3) the Phanotrom, (4) the ignition, (5) glow tubes, (6) the Thyratron, (7) the Pentode
e) Volt, ohm, milliammeters and uses
f) Ohmmeters, bridges, and testing resistors
g) Condensor markings, types, and tests
h) Speaker types and tests
i) Chokes and filtering
j) Audio-frequency transformers and tests
k) RF frequency and IF frequency transformers and tests
l) Volume and tone controls, tapers, and tests

[9]RCA Manufacturing Co., Camden, N. J.

m) Push button tuning and setting
n) Vibrators and vibrator testing
o) Microphones: carbon, crystal, dynamic, and impedance types

III. Jobs and projects

a and *b*) Running a characteristic curve
c) Testing tubes
d) Wiring a control circuit
e) Testing a.c. and d.c. voltages and currents
f) Reading and testing resistance with ohmmeter and bridges
g) Reading and testing condensors with capacitance checkers and bridges
h) Comparison method of speaker tests and adjustments
i) Measuring filtering effects
j) Transformer testing
k) Resonance measurement
l) Selection of proper volume or tone control and taper
m) Setting push-button tuners
n) Testing vibrators

Radio IV. Radio Maintenance and Servicing

Text: "RCA Tube Manual,"[10] and "The Radio Amateurs Handbook"

I. The fundamental objective of this course is to study the techniques of radio servicing as applied to various circuits using all practical methods.

[10]RCA Manufacturing Co., Camden, N. J.

Upper: Radio II—transmitter construction. Middle: Radio III—audio-frequency testing. Lower: Radio IV—trouble shooting

II. The following subjects will be diagrammed and explained, and the tests will be demonstrated. Faults will then be placed in the student's receiver which he is to find. The student is to keep notes and job sheets.

a) Power supplies — tests and analysis:
1) Cold cathode
2) Condenser input
3) Choke input
4) Mercury vapor
5) Bridge
6) Voltage regulators
7) Vibrator types
8) Motor generator types
9) Junction rectifiers

b) AF stages — tests and analysis:
1) Single ended
2) Push-pull types
3) Parallel and push-pull parallel
4) Phase inverters
5) Beat frequency oscillators

c) Detectors and AVC circuits — tests and analysis:
1) Diode types
2) Grid bias detectors
3) Grid leak condenser detectors
4) Tuning indication
5) Noise reduction
6) Discriminator circuits

d) IF stage types and crystal filtering — tests and analysis:
1) Choices of frequency
2) IF noise silencing circuits
3) Limiter circuits

e) Oscillators and converters — tests and analysis:
1) Screen grid grounded plate oscillator
2) Triode grounded plate oscillator
3) Triode tickler oscillators
4) Electron coupled or pentagrid converter
5) Hexode mixer
6) Pentagrid mixer

f) RF stages and TRF receivers
g) Aligning methods
h) Transmitter maintenance
i) Transmitter tuning procedure

III. Tests and analysis will be made using the following methods. After checking tubes,
a) Cold receiver analysis
b) "Screw driver-pliers" hot tests
c) Resistance analysis
d) Voltage analysis
e) Current analysis
f) Single generator and output meter
g) Signal tracers and signal analyzers
h) Wobulation generator and oscilloscope methods

Diagrams and explanations will be given of types not on hand.

Radio Communications I. Radio Code.

Text: ARRL Handbook,[11] Latest Edition

I. The objectives of this course include skills in handling code, operation of communication equipment, exploration of the occupational opportunities, and an appreciation of radiotelegraph leaders.

II. The student should gain a comprehension of the following subjects. This information is to be transmitted in daily classwork.
a) The code and its beginning
b) The history of radio communication
c) The radio spectrum
d) Using a key
e) Obtaining a government license
f) Signals

Two of the foregoing units should be complete and in notebook form at the end of each grading period.

[11] American Radio Relay League, West Hartford, Conn.

III. A working knowledge and the ability to operate the following equipment is required:
a) The switchboard and code machines
b) Echophone EC-1 receiver
c) Howard 436 receiver

IV. The code proficiency requirements are as follows:
a) Six words per minute straight copy at the end of the first six weeks
b) Ten words per minute straight copy at the end of the second six weeks
c) Thirteen words per minute straight copy at the end of the semester

V. Each day the student's work is to be checked by the instructor. This daily work is to be kept in a stenographer's notebook, available every class period. This log is important and should show all of the student's work. It will be the basis of the student's daily work grade.

VI. The student's ability to give proper signal reports, check frequency, handle messages, and use emergency operating procedure is to be demonstrated.

Radio Communications II. Radio Communication and Operation.

Student chooses one of the following:
a) Radio Amateur's Qualification
b) Commercial Radiotelegraphy
c) Commercial Radiotelephony

Text: A. "ARRL Handbook and License Manual"[12]
B. "Practical Radio Communication," and "Radio Operating Questions and Answers," by Wilson and Horning.[13]

I. The objectives of this course are twofold. For those choosing (*a*) radio amateur's qualification, they are industrial arts in nature. For those choosing (*b*) commercial radiotelegraphy, or (*c*) commercial radiotelephony, they are vocational in nature.

II. The student should choose either group *A*, *B*, or *C*, and keep daily answers to the questions in notebook form.
a) Radio amateur class *B* license
b) Radiotelegraph operator's permit. Answer in full from text element I the first six weeks, element II the second six weeks, and element V the third six weeks of school
c) Radiotelephone permit. Answer in full from text element I the first six weeks, element II the second six weeks, and element III the third six weeks

III. In addition the following code proficiency is required:
a) Fifteen words per minute straight copy at the end of the first six weeks
b) Eighteen words per minute straight copy at the end of the second six weeks
c) Twenty-two words per minute straight copy at the end of the semester

IV. The student is to have a working knowledge and ability to operate the following equipment:
a) Halicrafters communication receiver
b) RME 69 receiver and control table
c) Transmitters as assigned

V. A log is to be kept by the student where he records what he does each hour; also logs are to be kept properly at each receiver used.

VI. At the conclusion of the course the student is to demonstrate how to handle properly a radio telegraph station, give signal reports, check frequency, handle messages, and use emergency operating procedure.

Industrial Electricity I. Batteries, D.C. Generators and Appliances.

Text: None

[12] American Radio Relay League, West Hartford, Conn.
[13] McGraw-Hill Book Co., New York City.

I. The objectives of this course are: to develop ability to handle voltages, to use applicable tools, to increase knowledge of batteries, d.c. generators, and appliances, and to study the occupational opportunities in the direct current electrical field.

II. The following subjects will be studied and discussed and will form the basis for the student's notebook.
a) Ohm's law and its application in d.c. circuits
b) Primary and secondary cells
c) The dry cell and its assembly line construction
d) Application and testing of dry cells
e) Storage batteries: lead, acid, and Edison types
f) Discharge characteristics and charging
g) The elementary generator
h) Construction of d.c. dynamos
i) Construction of auto and airplane generators
j) D.c. motor characteristics
k) Starting motors and fractional horsepower d.c. motors
l) Shunt motors
m) Series motors
n) Compound motors
o) Starting and protective devices

III. These shop jobs and projects give the student a working knowledge of the parts, equipment, and processes.
a) Use of meters and the calculation of circuit values
b) Construction and testing of a Voltaic cell
c) Construction of dry cells on assembly line basis
d) Dry cell capacity, voltage, and instantaneous current tests
e) Construction and operation of a storage cell
f) Testing, charging, and repairing storage batteries
g) Identification of generator parts
h) Running generator characteristic curves
i) Testing car generators
j) Identification and testing motor parts
k) Testing and repairing starting motors and fractional horsepower d.c. motors
l) Running shunt motor characteristic curves
m) Running series motor characteristic curves
n) Running compound motor characteristic curves
o) Connecting starting and thermal switching boxes to d.c. motors

Industrial Electricity II. A.C. Transformers, Motors, Generators, and Ignition Systems

Text: None

I. The objectives of this course are: to develop the ability to handle voltages, to use applicable tools, to increase knowledge of a.c. transformers, motors, generators, and ignition systems, and to present the occupational opportunities in the alternating current fields.

II. Things the student should know. Students are to keep notes on information and demonstrations given.
a) Alternating current and voltage characteristics
b) Transmission of power
c) Theory and applications of inductance
d) A.c. transformer characteristics
e) A.c. switching and protective devices
f) Fractional horsepower a.c. motors
g) Signal phase motors
h) Three phase motors
i) Generation of signal phase voltages
j) Production of poly phase voltages

k) A.c. electrical measurements
l) Ignition coils and magnets
m) Simple ignition systems
n) Aircraft electrical systems
III. Shop jobs and projects
a) Calculation of a.c. values
b) Calculation of motor and generator sizes to fit the job
c) Solenoid and coil testing
d) Transformer testing
e) Proper connection of starting and protective devices
f) Trouble location in fractional horsepower electric motors
g) Measurement of a.c. voltages, currents, wattage, and kilowatt hours
h) Ignition coil and magneto testing
i) Tracing auto ignition systems
j) Diagramming and tracing aircraft electrical systems

Industrial Electricity III. Coil, Transformer, and Motor Winding.

Text: None

I. The purpose of this course is to study and apply practical windings of coils, transformers, stators, and armatures, and to explore the field of motor and generator repair.

II. The following subjects are to be discussed and demonstrated and will form the basis of the student's notes.
a) Solenoid characteristics and winding
b) Construction of transformers
c) Forms of alternator windings
d) Single phase stator winding
e) Three phase winding
f) Double voltage winding

III. The following shop jobs and projects form the basis of the student's *doing processes.*
a) Calculation and winding solenoid
b) Calculation and construction or repair of a transformer
c) Winding or rewinding a fractional horsepower motor or generator

Industrial Electricity IV. Electrical Maintenance

Text: None

I. This course is planned to develop abilities in doing, understanding facts that condition, and appreciating industrial relations that effect the job.

II. Things the student should know.
a) How to bend and run conduit, Greenfield, and Romex
b) The National Electric Code
c) Proper control of a.c. and d.c. appliances
d) Trouble shooting in circuits
e) Care of moving parts
f) Bearing and shaft maintenance
g) Maintenance of electric irons and stoves
h) Maintenance of magnetic brakes, chucks, and clutches
i) Commutator maintenance
j) Replacing brushes and contact points on controllers
k) Maintenance of oil switches
l) Industrial relays
m) Use of synchronizing equipment

III. Jobs and projects
a) Bending and running conduit, Greenfield, and Romex
b) Planning an installation using the National Electric Code as base code
c) Connecting controls for appliances
d) Trouble shooting problems
e) Oiling, greasing, and checking pulleys, belts, and gears
f) Oiling, greasing, and checking shafts and bearings of motors
g) Locating trouble and repairing electric irons and stoves
h) Setting magnetic brakes, diagram wiring of chucks and clutches
i) Cleaning a commutator
j) Replacing brushes or points
k) Replacing parts or oil in oil switch
l) Connecting an industrial relay
m) Use frequency meter or synchroscope

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Admission of Candidates to Phelps Vocational School

*Paul Cooke**

Examinations offered to candidates for admission to the two vocational schools, Divisions 10–13, Phelps Vocational School for boys, and M. M. Washington Vocational School for girls, Public Schools of the District of Columbia, have the main objective of improving prospective material by selecting better candidates, barring extremely poor material, and encouraging boys with some confidence in their ability to stand the tests. Together with examination of the boy's previous academic record, his attendance and health records, with the counselor's interview the examinations thus serve to set a standard of admission for candidates.

*Phelps Vocational School, Washington, D. C.

The testing proved what had been long concluded that the vocational schools were being sent pupil material testing below grade levels, even "considerably inferior,"[1] and registering in aptitude and intelligence quotient brackets an average somewhat below 100.

Candidates, assembled in some centrally located secondary school, take three tests administered by the department of research, divisions 10–13, Public Schools of the District of Columbia. The tests used are (1) the California Mental Maturity, S-form, Elementary, yielding an intelligence rating, (2) the Gray-Votaw Achievement Test, reading and arithmetic, and (3) the Detroit Mechanical Aptitude Test, Form A. Usually all tests are administered the same day, two of the tests before lunch and the third after lunch; the youth seem to survive this apparently stiff dose of examining.

Machine-scored tests such as the Gray-Votaw and the California Mental Maturity are usually scored by the department of research. Often the Detroit Mechanical Aptitude Test is scored by teachers on the committee on research at Phelps Vocational School.

Since the testing program for candidates for the vocational schools was initiated

[1] T. L. Norton in his New York State Regent's Investigation, *Education for Work* (New York: McGraw-Hill Book Company, 1938), pp. 64–65, concluded from testing that the vocational pupil was distinctly lower than the pupil of the general secondary school in achievement.

in 1941, over 600 boys have taken these tests. About 15 per cent of those tested have not been admitted because of test marks unsatisfactory to the board of review, the committee set up to consider admissions, advanced standing, and graduation. Another 15 per cent of those tested do not appear in person for admission after they have completed the three tests; these boys generally score low. Thus, the test has served to bar much of the extremely poor material sent from elementary schools and transferred from junior high schools. (Phelps is on a junior high school academic level.)

A number of applicants for admission do not take the tests but appear at the school for admission. These are tested at school by the testing committee.

The tests have shown several statistically proved things. There was found, through application of the product-moment correlation procedure, that in 100 cases the correlation between the mechanical quotient and the intelligence quotient was 78, between 100 scores on the reading and arithmetic sections of the Gray-Votaw test, 76. This would tend to show that either one of the two separate measures is a fair index of the boy's ability, and has led the committee on occasions when it was impossible to administer the battery of tests to a lone candidate to rely on one of the four measures.

A secondary use to which the testing results have been put has arisen from an administrative problem. Since Phelps is on an academic level with the junior high school, the boys transferred from the junior high school ninth grade may be scheduled with the sixth-grade elementary school graduate for general vocational subjects. Then, too, an extremely large entering class is the experience each semester together with a high mortality rate in each following semester. These two factors, a large entering class and the placement of each transfer in the first semester, has resulted in a disproportionate number of boys being assigned to the 1A grade or first semester group — sometimes 15 times the number of boys in the graduating class.

The use of the testing program shows excellent grades for some of the boys taking the entering tests. These boys are shoved up from one to three semesters in the general vocational work, while, of course, remaining first semester in shop and technical related work. Although the standard has varied from semester to semester, generally boys testing well above 100 in the mechanical and intelligence tests, or making a grade level in reading and arithmetic above their previous grade level, are advanced. Thus, through this testing, more homogeneous classes and more evenly divided classes have been made possible.

It is likely that Phelps Vocational School will continue to make use of this testing program. Possibly the Pintner General Ability Test may be substituted for the California Mental Maturity for an intelligence rating. The Iowa Silent Reading Test may be used in place of the Gray-Votaw reading section because of the more comprehensive evaluation of the former, but achievement tests of reading ability will not be abolished because the school believes that the general education side of the vocational student's preparation should not be neglected in emphasis on practical and related work. At present the accomplishment of the two objectives, that of placing and measuring the candidate, appear to justify the use of the test battery.

The faculty feels justified in administering these tests and denying admission to candidates who fail to meet the standard. It agrees with a statement of a recognized vocational authority, Charles Prosser, who stated that vocational training must be based on intelligent selection of pupil material — those competent to make good mechanics.[2] At present very few schools have set up procedures for examining entering students and applicants, T. L. Norton declared in his examination of practices in New York State vocational schools.

The next development at Phelps in testing likely will be utilization of tests to determine aptitude for different trades and shops.

[2] *Charting the Course for Vocational Education*, Ed. John A. Lapp (Chicago: Citizens School Committee, 1835 North Wabash Avenue, 1939), p. 70.

Further Experiments With The Midget Wiggly Block Test

*Howard O. Reed**

The writer was originally motivated to do something about the problem confronting some shop teachers who teach in schools where industrial arts is an elective, wherein they found among their enrollees many students "guided" into their courses, as well as those who "elected" to take it. Due to the large number of apparent misfits it was assumed that, since the "guiding" practice was based only on the I.Q. in many cases and supplemented by results from a reading test in others, there must be other abilities to be further explored and measured for guidance purposes in this area. In schools where industrial arts is a required subject a need was also apparent to devise a method to group the students more or less homogeneously for educational efficiency. This seemed particularly urgent when the shop was organized on the plan where two or more units of work were offered in the same shop at the same time. It was thought that instruction could be conducted more efficiently if the members of given groups progressed more nearly at the same rate. This argument would also seem to hold true where the unit shop plan is used and the groups progress from one shop to another.

In the earlier report,[1] mechanical ability was defined as the ability to succeed in the school shop, or that capacity to do work with one's hands, hand tools or machine tools.

An attempt was made to design the midget Wiggly block test so that the score made on the test would represent a composite of essential factors for success at this type of work. The cuts of the blocks are obvious; that is, they are distinctly different and no two cuts on the same block are alike. The blocks are made small enough so that a fair degree of finger dexterity is required to place the pieces together correctly, once the subject being tested sees how they fit together. One subject remarked after being tested, "A fellow sure couldn't put that thing together with boxing gloves on." Insight as to form and shape in three dimensions and the competency to assemble the small pieces are the factors influencing one's capacity to do the test quickly. The accompanying illustration shows a girl receiving instructions before assembling the test.

The test[3] consists of four blocks 2½ in. long. One is jig-sawed lengthwise into four pieces, another into six pieces and a third one into nine pieces, while the fourth one

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[1] Reed, Howard O., "The Midget Wiggly Block Test for Mechanical Ability," INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, April, 1941, p. 153.

[3] Produced and distributed by the C. H. Stoelting Co., 424 North Homan Avenue, Chicago 24, Ill.

serves as a model and is not cut. The test is individually administered and one's score is the mean of the two most consistent times of three or four trials for assembling all three blocks. A fourth trial is given if the difference between the two most consistent of three times is greater than one fourth of the greater of these two. A correlation between the two most consistent trials gives r a value of .90 ± .012, N = 150. A correlation between test score and mark in shopwork gives r a value of .470 ± .045, N = 150. The scores are expressed in terms of minutes and hundredths thereof. Table I will give some indication as to the range of the scores.

TABLE I. Showing Scores for Composite Groups of Men and Women and Ranking of Those Scores

P.R	Men (N = 340)	Women (N = 100)
100	1.10	1.50
75	2.86	3.49
50	3.75	4.64
25	4.77	7.00
1	23.74	26.88

Numerous groups have been tested and so far as possible, validating information established. Follow-up work has been extremely difficult since most of the high school boys who have been tested during the past seven years have entered the armed forces. The identity of certain groups will tend to establish validity; that is, if students of a vocational course are selected, that group should rank higher on the test than an unselected group of a similar class. Furthermore, a selected group at the low end of the scale should not do as well as an unselected group. The last members on the WPA, I believe constitutes such a group.

The following information is submitted, in addition to that of the earlier report, to establish validity of the Midget Wiggly Block Test.

High School Students

Scores have been obtained from high school students ranging in age from 14 to 18 years. High schools from which data were secured are Lockport Township High School, Lockport, Ill.; Bloomington High School, Bloomington, Ill.; Boys' Industrial School, Lancaster, Ohio; University High School, Normal, Ill.; Lebanon High School, Lebanon, Mo.; and Mexico High School, Mexico, Mo. Validating information was not available in some cases. There does not appear to be significant age differences between the age groups tested. Median scores for unselected groups among the various schools showed insignificant variation, while a selected vocational group did vary.

The 1941–42 metal shop class of 57 students at the Lockport Township High School shows that $Q_1 = 4.66$, Mdn = 3.66, and $Q_3 = 2.90$; also that 21 of the 29 students in the upper half, according to test scores, did work above average in shopwork, and that 18 of the 28 in the lower half did work below average as indicated by second semester marks in the subject.

Information supplied for eight individuals at the Boys' Industrial School, Lancaster, Ohio, September, 1941, is shown in Table II.

At the Bloomington High School a student was required to make a *B* or an *A* in industrial-arts general metal before being admitted to the vocational metal course. The mean of the test scores for six making an *A* in vocational metal the second semester 1942–43 or 1943–44 was 1.99; the mean for eleven who made a *B* was 3.19, and for six who made a *C* the mean was 3.47.

Information for a class of nine unselected vocational metal students at the University High School, Normal, Ill., is shown in Table III.

A portion of a master's thesis[5] was devoted to computing the zero order correlation of the Midget Wiggly Block Test, and two well-known paper-pencil mechanical ability tests (Detroit and Stenquist), and the I.Q. (Otis Self-Administering, Form A), N = 90.

The following data are reproduced from the thesis with the author's concent:

TABLE II. Showing Test Scores, Shop Ratings, I.Q.'s, and Ages of Eight Boys From The Boys Industrial School, Lancaster, Ohio

M.W.B. Test Score	Shop Rating	I.Q.	Age
2.30	Excellent	120	15
2.70	Good	93	16
4.73	Fair	80	18
4.81	Fair	78	15
5.81	Poor	89	16
6.82	Poor	86	18
7.25	Below av'ge	56	15
10.50	Very poor	64	18

TABLE III. Showing Test Scores, Shop Marks, and Ages of Nine Unselected Vocational Metal Boys From University High School, Normal, Ill.

M.W.B. Test Score	First Sem. Shop Mark	Age
2.22	A	17
2.67	D	16
3.27	A	16
3.34	B	17
3.86	C	17
3.94	D	16
4.13	F	16
4.27	C	16
4.41	C	18

TABLE IV. Data Reproduced From Henry A. White's Thesis

Test	Detroit	Stenquist I	Stenquist II	I.Q.	M.W.B.
Detroit					
Stenquist I	r = .40 PE = ± .07				
Stenquist II	r = .45 PE = ± .07	r = .65 PE = ± .05			
I.Q.	r = .60 PE = ± .05	r = .17 PE = ± .07	r = .69 PE = ± .04		
Midget W.B.	r = .40 PE = ± .07	r = .36 PE = ± .07	r = .27 PE = ± .07	r = .18 PE = ± .07	

It is a regrettable fact that there was no criterion included in this study indicating comparative success in actual shopwork. The study included a report of the success of the students on an auto mechanics achievement test, but these findings have little value in this report; hence are not included. Plus values for r from .27 to .40 indicate that there is some similarity between those capacities measured by the paper-pencil tests and the Midget Wiggly Block Test. The r value of .18 between the Midget Wiggly Block Test and I.Q. indicates a low relationship. The earlier report gave r a value of .017 between these two criteria.

Part of the final examination, at the end of the first semester in a first-year mechanical drawing course at the University High School, Normal, Ill., consisted of drawing a problem in revolutions and one in auxiliaries. Each of these phases of mechanical drawing requires a rather high degree of visualization. A rather careful scoring system was used to check the student's solutions and from these scores the four highest and the four lowest students from a class of 20 were tested with the Midget Wiggly Block Test. The scores of the four highest were 2.20, 2.45, 2.45, and 2.30 respectively, while the scores of the four lowest were 11.50, 6.00, 5.65, and 5.15 respectively.

[5]White, Henry A., "Correlation Between Mechanical Aptitude and Information Relating to Auto Mechanics as Measured by Certain Objective Tests," *Unpublished Thesis*, Iowa State College, Ames, Iowa, 1940.

WPA (Men)

A group of ten WPA men referred for training to the National Defense Training Program at the Lockport Township High School, Lockport, Ill., during the summer of 1941, shows test results of $Q_1 = 8.52$, Mdn = 6.26, and $Q_3 = 4.56$. Three of these men entered semiskilled jobs for which training was given and the remaining seven entered unskilled jobs.

During May, 1942, the WPA Rockford, Ill., district office referred 27 men to the same training program to be tested and interviewed. Of these, seven did not report, and of the 20 reporting, 9 left the test unfinished with an average effort of 28 minutes! Reasons given for quitting were, "Too hard on eyes"; "Not suited to this sort of thing"; or, "I just can't do it." Of the eleven completing the tests $Q_1 = 12.65$, Mdn = 7.70, and $Q_3 = 4.69$. All of these men were referred for training in either machine shop or welding and not one was placed at other than common labor when they entered employment. Their teachers reported them as being, "untrainable," after approximately a two hundred hour course.

WPA (Women)

During June, 1942, 34 women on the WPA were referred to be tested and inter-

viewed. Of these, 7 did not report; 7 gave up after an average effort time of 31 minutes, and 20 completed giving $Q_1 = 12.29$, Mdn = 7.05, and $Q_3 = 4.69$. Most of these were referred for training and only 3 (3 of the top 4 on the test) showed evidence of becoming proficient enough at machine tool operation to refer for employment at the time the WPA was discontinued. Adequate follow-up information is not available to report the type of employment they entered and later success, except for one person. Her score on the Block Test was 2.40. She received employment at an aircraft plant and proved to be "emotionally unstable" as reported by her employer. She was discharged for losing her temper too often and too completely.

Supplementary Trainees (Men)

It could be said that there was a degree of selectivity connected with this group due to the fact that the men were employed at unskilled or semiskilled jobs and were taking the training for upgrading purposes at their place of employment. The training was in machine-shop practice at the Lockport Township High School War Production Training Program. Test results show that $Q_1 = 3.90$, Mdn = 3.37, and $Q_3 = 2.52$. Follow-up data are not available for these men for some entered the armed services, and others migrated from the community.

Unselected Women

Eighteen women referred by the USES, Joliet, Ill., to a vestibule training program at an aircraft plant which was operating under the auspices of the Lockport Township High School War Production Training Program, were tested with the Midget Wiggly Block Test. Nine of the 18 who succeeded in passing the training work had scores of $Q_1 = 4.46$, Mdn = 3.77, $Q_3 = 3.33$. The nine who failed to pass the vestibule training work had scores of $Q_1 = 8.25$, Mdn = 5.80, and $Q_3 = 3.21$.

Teachers of Shopwork

Nine teachers of shopwork, six craftsmen from industry and three high school industrial-arts teachers, were tested with the Midget Wiggly Block Test and scores made were $Q_1 = 2.73$, Mdn = 2.21, and $Q_3 = 1.64$.

Conclusions

From the foregoing data it appears that the score of the Midget Wiggly Block Test gives some indication of one's probable success at shopwork. It does measure what it purports to measure — the ability to do shopwork successfully when that shopwork consists of using one's hands, hand tools, and power driven tools. It seems, however, that there are certain factors that inhibit some individuals using their ability and also certain other factors which give other individuals unusual drive at their work. This tends to cause the exceptions.

TABLE V. Showing Summary of Groups Included in This Report

Group	Q_1 Score	Q_1 P.R.	Mdn. Score	Mdn. P.R.	Q_3 Score	Q_3 P.R.
Lockport Township high school boys N = 56	4.66	27	3.66	51.5	2.90	74
Lancaster Boys' Industrial School N = 8	7.04	9	5.31	20	3.77	48
Bloomington High School Selected Vocational Metal N = 23	3.20	65	2.72	79	1.40	98
University High School Unselected Vocational Metal N = 9	4.20	38	3.86	45	2.97	72
WPA men referred in summer of 1941 N = 10	8.52	8	6.26	12	4.56	29
WPA men referred in May, 1942 N = 11	12.65	4.5	7.70	10	4.69	26
WPA women referred in June, 1942 N = 20	12.29	7	7.05	24.5	4.69	49
Unselected women N = 18	4.46	31	3.77	69	3.33	78.5
Supplementary trainees employed men N = 32	3.90	44	3.37	57	2.52	86
Teachers of shopwork N = 9	2.73	79	2.21	92	1.64	98.5

Of course there are other factors which enter the picture that determine one's capacity to deal effectively and efficiently with an environment of the type described — among these are one's ability to do the essential mathematical calculations, read direction sheets and blueprints, and interpret certain scientific principles. It is not claimed that this test attempts to measure these capacities.

The test score furnishes just one link in the chain of facts needed for guidance purposes. Since studies fail to show a significant negative correlation (in fact, it is usually slightly positive) between scholastic aptitude (I.Q.) and mechanical ability guidance persons should go slow when *guiding* a person into the mechanical trades when he has a low I.Q., even though it is supplemented by a low reading test score. Further testing should be done to explore other possible areas which show significant trends in one's capacities. It may be that ability to do shopwork will rank high, but the chances are about equal that they will rank low. The same statement holds equally true for those with a high I.Q.

Each shop teacher should have some objective evidence as to the mechanical ability of his students, as well as knowing what other test results are, such as I.Q., reading, mathematics, social, emotional, interests, and such other test information that is available for his students. He can better teach his students if he *really* knows them, even though he is not teaching under circumstances where it would be desirable to use the test results for grouping his students.

Administering the test

Further Research Needed

Following are some research problems which need to be worked on:

1. Establish age differences below age 15, thereby establishing maturity age of mechanical ability.
2. Establish effect of shopwork experience on test results.
3. Establish relationship between rate of learning as shown by the various trials of the block test and as indicated by progress in shopwork.
4. Conduct case studies to determine why one with a rather low test score succeeds and why one with a rather high test score fails.

All Americans should be equipped with common learnings, the minimum of facts, knowledge, and skills, that will enable them to live together with mutual understanding and good will. — *Alexander J. Stoddard* in *Illinois Vocational Association Convention by Mail.*

Visual Aids in the Painting and Decorating Trade

*Henry Wagner**

The Milwaukee Vocational School, through its visual aids department, continually maintains exhibits on the various floors of its large building. These exhibits are informational in nature to the public, school staff, instructors, and students, and display the features of the trades which are taught at the school.

The second floor exhibit periodically houses an interesting display on paper hanging, which portrays the "story behind the trade." It is illustrated by pictures which show the recent developments in the trade and reveal facts not generally known to the layman.

A large number of faculty members and evening school students, after viewing the last exhibit, showed keen interest and became quite wallpaper conscious because they asked many pertinent questions.

The upper portion of the exhibit, as shown in the accompanying illustration, shows different types of rooms with colorful, interesting wallpaper treatment, in which both beauty of color and good design are combined. Each room uses a wallpaper design in keeping with the room and its furnishings, and a color in harmony with the general decorative scheme.

Visual aids are also used very effectively in the related science and technology

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EXHIBIT BY HENRY WAGNER

Visual aids used at the Milwaukee Vocational School

classes for day school students, apprentices, and evening trade extension classes in painting, decorating, and paperhanging.

The lower portion of the exhibit illustrates the various steps in making wallpaper.

Figure 1 shows mammoth rolls of paper waiting to be made into wallpaper.

Figure 2 shows how the white clay is dumped into vats below the floor level. Then, sizing and color pigment for the ground color of the wallpaper are added after which long metal arms reach down and stir the entire mass.

Figure 3 shows how dry pigment color and size are being thoroughly ground in ball mills. This is done by formula and the strainer which results is combined, in separate mixing vats, with the white to produce the tints used for the background color of the wallpaper.

Figure 4. The colors which will be printed onto the plain background are mixed and blended by eye and experience, not by formula. The men who do this blending are artists and know their colors.

Figure 5. The ground machines then print the ground coating in the desired tint on the wallpaper.

Figure 6. The designs are printed on next. This is done by great machines, which stand in a line at the end of the room. There may be as many as 13 colors needed. This means that there will have to be 13 rollers, as one is required for each color.

Figure 7. Testing paper for washability is done with a washing machine which works back and forth in a lathered frenzy over a little strip of paper.

Figure 8. Papers are also tested for light fastness with a fadeometer which focuses arc lights on them for a space of time equivalent to three years.

Figure 9. Shows how the designs are hung up to be studied for coloring and other defects which need correction.

Figure 10. The wallpaper is then submitted to further tests and checks to make sure that the designs and colors match properly. This check is made to eliminate any leaning or streaking, or optical illusions that might not be apparent when smaller strips are examined.

The paper is then ready to be cut into standard-size commercial rolls, generally 16 yards to a roll.

Making the Printing Roller

Another phase of making wallpaper is to cut the roller for printing. Each color in the paper on your wall was put there by a separate roller. Each color and each shade of color — dark red, light red, blue, yellow, green, requires a separate roller. There can be no combining of colors, or shading.

At the lower left-hand corner of the illustration that accompanies this article is shown a complete roller, ready for printing one color.

Figure 1 shows a roller as it looks when the block cutter starts transforming it into a roller for printing wallpaper. It is shaped like a giant rolling pin made of maple.

A tracing is made of the design on a piece of tracing paper which fits around the roller very exactly. The block cutter then outlines on the roller all those portions of the design which are to appear in a certain color. After outlining the parts traced with ink, he paints the outlined portions in red so that the pattern stands out boldly.

Figure 2. Then he hammers short strips of brass about ½ in. wide edgewise into the block, following the outline of the pattern exactly. To do this, the brass strips must be bent and shaped to fit the outline of the design drawn on the roller. The brass strips are hammered in until only a small part of them extend above the roller.

Figure 3. The brass outlines are then filled with a special felt. This is done by hammering the felt against the brass until it fits down flat and the brass edging has cut clear through. The purpose of this felt is to pick up its particular color and print it on the paper.

Figure 4. The brass and felt surfaces are next ground smooth and subjected to a machine which "pumices" them all even and removes any possible irregularities.

Figures 5 and 6. Parts of the wooden surface of the roller immediately around the design are then routed out so that there is no danger of the wood surface picking up color and leaving it on the paper.

Figure 7 shows a stockroom in which the rollers are stored on racks.

Brief History of Industrial Arts and Vocational Education

*Erhard F. Wendt**

(Continued from page 203 of the May, 1946, issue)

Federal Aid in Vocational Education

The Federal Government was looked to for aid in vocational education for several reasons. First, local governments were already burdened with general education. Second, laborers moved from one state to another, and for that reason it would be unfair to expect anyone state to assume the financial responsibility for the education of this type of worker. Third, the Federal Government had recognized its responsibility in the furtherance of vocational education in the enactment of the Morrill Act of 1862, and in such subsequent legislation, as the Hatch Act of 1887 which established experimental stations, and the second Morrill Act of 1890 which provided more land than was originally granted in 1862. Up to 1917 the Federal Government recognized its responsibility only to the adult workman. In that year the Smith-Hughes or National Vocational Education Act was passed and signed by the president (Wilson). The education provided for under this bill was to be of less than college level. No students of less than 14 years of age were to be admitted to these schools for aid. The act was a continuing act and provided seven million dollars for vocational education in three fields. Agriculture was to receive three million. Home economics and trade and industrial education were provided with 3 million. This act differed from those preceding in that it granted money on a reimbursement basis only. The various states spent their money in these fields, and at the end of the year the Federal Government reimbursed them with half the money spent for salaries. Allocation to the states for Agriculture was made on the basis of rural population.[27] Money to home economics and trade and industrial education was made on the basis of urban population. Of the three millions allocated to the last two named fields, home economics was to receive not more than 20 per cent. The allocation for teacher training was made on the basis of total population. Moreover, to qualify under this act, the instructor must be a certified Smith-Hughes man, the individual states setting up the requirements for his certification.

Common to all states, is the requirement of practical trade experience. However, the amount of practical experience asked varies in the different states. In Minnesota the amount must be acceptable to the director of vocational education. The

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[27]Included cities up to 2500.

course taught must be vocational and the equipment must be adequate in the judgment of state and federal supervisors. Day schools, evening schools, and part-time schools may qualify for reimbursement. All schools must be public to receive aid. Classes may be for either one or two purposes. They may be for purposes of trade preparation, or for trade extension. Subjects must be shop courses or studies in related information. The United States is divided into four regions: New England, Southern, Central, and Western. Each state submits its plan of vocational education to the Federal Government for approval. Money may apply to local directors, principals of trade schools, coordinators, itinerant teachers, itinerant teacher trainers, co-operative half-time directors, supervisors of apprenticeship, conference meet leaders, and classes that are held in shops and stores under public supervision.

The Smith-Hughes Act has been, perhaps, the largest single factor in determining the character of the more recent growth in the field of industrial-school education.[28]

Of additional importance to the industrial and vocational movement in the U. S. was the George-Reed Act of 1931,[29] which gave two and one half million dollars to agriculture and home economics. Although not mentioned in this act as a direct beneficiary, trade and industrial education profited indirectly. These branches found it unnecessary to release as much of their money to home economics.

Three years after the enactment of the above act, the George-Ellzey Act, passed in 1934, took its place. Agriculture and home economics were each given a million dollars in addition to that which was available under the Smith-Hughes Act. Neither the George-Reed nor the George-Ellzey Act provided funds for teacher training.

The George-Deen Act, passed in 1936, made available 14 million dollars in addition to that already available under the Smith-Hughes Act. The money was to be spent under the supervisory machinery established under the Smith-Hughes Act. A new field was added in this last act, namely, that of distributive education. Under the act, Congress is to fix the amount spent, but this amount is not to exceed 14 million dollars. The first year, Congress appropriated the full amount.

On July 3, 1940, President Roosevelt approved a 15 million dollar appropriation for a vocational training program for defense workers. Public school equipment was used for this training. Classes ran six hours a day for a period of six to ten weeks. Two classes of training were offered at the start. One for the persons already in defense industries to improve their skill. The other for unemployed persons with some work experience in fields related to defense, but who have grown rusty.[30]

Apprenticeship 1900–38[31]

The first modern apprenticeship law was passed in Wisconsin in 1911. This law required that all apprentices were to attend school five hours per week. This law was amended in 1915. The amended law placed apprenticeship under the jurisdiction of the State Industrial Commission. The State assumed the responsibility for keeping up apprenticeship requirements and the adjustment of the differences between employer and apprentice. The next milestone in apprenticeship history occurred in 1920 when the American Construction Council appointed a general apprenticeship committee. F. D. Roosevelt, at that time president of the council, pointed out the necessity of arousing the country to the need of placing skilled manual labor on a par with clerical and nonmanual occupations. With the advent of the N.R.A., the Federal Commission for Apprenticeship Training was established in 1934. This commission was to function under the Secretary of Labor. When the N.R.A. ceased to exist, the function of this commission was felt to be important enough to rate a continuation of its existence under the sponsorship of the N.Y.A. In 1937, the Fitzgerald Act authorized the Secretary of Labor to formulate and promote the furtherance of labor standards necessary to safeguard the welfare of apprentices. A second provision of the same act requested that the Secretary of Labor take steps to bring together employers and labor to formulate an apprenticeship training program.

Present-Day Industrial and Vocational Education

At the present time vocational education is being offered in four different types of schools, one of which is the public school. Under this classification there are three different varieties of schools: the part-time, evening, and the day school. As the name implies, these schools are publicly controlled. A second type of school is the private or profit school. The operators of this school regard education as a commodity to be sold at as high a profit as the customer will tolerate. A third type school is the endowed school. Outstanding schools of this kind are Dunwoody Institute in Minneapolis, Ramkin in St. Louis, and the Wiggins Trade School in Los Angeles. The fourth type school is the corporation school in which the training is given for a specific skill or information needed for successful employment and efficient service in the particular factory providing this training.

Vocational education is nationwide. The expansion thus far is only a forerunner of what is to come.[32] The demand is increasing more rapidly than are the facilities provided for it. Moreover, the aims of this type of education have been clarified. In many communities vocational education started as a means of education for average or subnormals only. It has taken a long time to outgrow this stigma or label, but now vocational education has become "respectable."

During the early decades of the twentieth century attention had been centered upon vocational training aspects of the problem of occupational adjustment. A new conception of the whole scope of occupational adjustment has crystallized quite recently. The occupational training or occupational adjustment program is now coming to comprehend or include the entire problem of genuine vocational guidance, occupational or vocational training, job placement, follow-up, and retaining services.[33]

A study of the subjects offered most frequently, and those attracting the largest number of students in the industrial field are the woodwork courses, farmshop, drafting, metal, electricity, printing, and automechanics.[34]

States having 2000 industrial and vocational shops are California, Ohio, and New York. Those having 1500 to 2000 include Iowa, Pennsylvania, and Michigan. In the 1000 to 1500 class, Indiana, Illinois, Kansas, Massachusetts, Wisconsin, Minnesota, and Texas are listed. Those operating between 500 and 1000 shops are Missouri, Oklahoma, New Jersey, Washington, Tennessee, and West Virginia, and those maintaining from 250 to 500 shops are Nebraska, Colorado, Maryland, Virginia, North Dakota, Kentucky, Oregon, Alabama, Arkansas, Connecticut, Florida, and South Dakota.

When the number of shops in operation is divided by the population, Iowa, Kansas, and Utah have more shops per unit of population than any of the other states.

In Minnesota there has been a rapid growth in recent years in the number of teachers employed in industrial and vocational education. In the year 1938–39, a total of 674 were employed. The year following, 718 were employed. The total estimated for 1940–41 has been given at 900.[35]

The field of industrial education contributes to all of the seven cardinal objectives of education. However, it is felt that the contributions of this field are perhaps greater to the third, fourth, fifth, and sixth of these objectives.[36] A set of objectives set up especially for this field by Dr. H. J. Smith are as follows:

1. To develop skill in the use of common tools.
2. To afford industrial information and social intelligence.
3. To foster appreciation of good materials and workmanship.

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[28] Anderson, L. E., *Hist. of Manual and Industrial Sch. Ed.*, p. 237.

[29] An act to be in force for three years from the date of its enactment.

[30] *Minneapolis Star Journal*, July 5, 1940.

[31] Industrial Arts and Vocational Education, Vol. XXVIII, 1939.

[32] Dennis, L. H., Industrial Arts and Vocational Education, 1939, Vol. XXVIII, p. 13.

[33] *Ibid.*, p. 10.

[34] Industrial Arts and Vocational Education, Vol. XXVIII, pp. 8–10.

[35] Smith, H. J., Lectures.

[36] Bawden and others, *Industrial Arts in Modern Education* (Friese, J. F.), p. 144.

4. To further intelligent choices of life occupations.
5. To inculcate worthy personal traits and attitudes.
6. To provide a measure of specific occupational training.

The nature of industrial work in the present elementary day school is handwork based largely on the use of materials, and child nature. The junior high school industrial arts is based on the use of materials and studies of occupations. The senior high school program is based on manipulative processes and technical information.[87]

Present-day trends and practices may be briefly listed as follows:[88]

1. The trend toward larger units of instruction. The development of student initiative, problem planning, and solving ability.
2. Subject matter will cease to be important in itself. Its meaning and need will depend on our personal social pursuits.
3. Tendency toward laboratory types of learning, general in character rather than specific skill mastery requirements. This is especially true at nonvocational levels.
4. Preparation for adaptability to changing economic conditions rather than intensive but comparatively narrow specializations formerly emphasized.
5. Activity considered as a means of motivating the learning of information.
6. Industrial-arts education as an avenue to a liberal and appreciative understanding of industrial life necessary for boys and girls alike.
7. Lectures and demonstrations now being supplemented with instruction sheets. Initiative in planning and procedure has been shifted from teacher to learner.
8. Increased professional preparation for teachers.
9. Increase in size of classes.
10. With increasing guidance work, there is a tendency toward more individualized instruction.

[87] Schweickhard, D. M., *Industrial Arts in Education*, pp. 55–56.
[88] Bawden and others, *Industrial Arts in Modern Education* (Stone, W. H.), pp. 133–140.

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Techniques Used in Teaching Machine-Shop Operations to the Blind

*Robert S. Hunter**

(Continued from page 213 of the May, 1946, issue)

Aptitude Testing

Need for Aptitude Testing. The preceding sections have developed the techniques employed in training the blind in machine-shop practice. The need for testing the blind and comparing their work objectively with a sighted group has been stressed; it remains now to discuss a third problem of particular interest to the employment counselor or psychologist.

The psychologist or employment counselor is concerned with job placement. He counsels individuals when they seek his services, and he tries to find out the possible fields of work in which the individual is likely to be successful. He tests their general intelligence, their interests as measured by an interest questionnaire, and their aptitudes for the field in which they happen to show interest. He also checks up on their personality as measured by some personality inventory. After he has accumulated all the pertinent data, and has pondered their significance he is in a position to offer suggestions. His conclusions may not be a hundred per cent correct, but they will be better than a guess.

Sighted individuals have seen the need for this sort of service, and there are perhaps more cogent reasons why the blind should have it. It would appear to be a mistake to attempt to train a blind person, and then discover that he lacked the aptitude necessary for success. When a blind individual succeeds the visually handicapped are encouraged; but when a blind person fails he may hold back more talented members.

Testing the Sighted Group

Of particular moment in this study has been the endeavor to find an instrument that would predict with some degree of success aptitudes for machine-shop work. It is known that the ability to think in terms of spatial forms appears to be a common denominator for engineers, draftsmen, and the mechanical trades. Hence, some test that would have aspects of spatial perception was indicated. The writer thought of first using the Senguin Form Board which is one test in the Arthur scale. After a suggestion from Dr. William R. Grove, Psychology Department, University of Pittsburgh, he decided to use the Witmer Form Board which is similar in form to the Senguin but more compact. It has the additional advantage of having eleven sections instead of ten.

The Witmer Form Board has application for the younger age level group, but for older subjects it becomes a sort of manipulatory test. Surprisingly enough, and fortunately for this study, when an older subject is blindfolded the test appears to take on aspects of spatial perception.

The Witmer Form Board test was first administered to the sighted group. Like the Senguin Form Board the Witmer is presented to the subject with all the pieces inserted. The pieces are approximately the same size but have different shapes, for example, circular, square, rectangular, star shaped, etc. Before presenting the sighted subject with the test he was blindfolded. The board was placed before him, and he was informed that the test had in it a number of blocks having different shapes. He was told to extend his hands and at the word "Go ahead" he was to be allowed thirty seconds to "feel" the pieces and discover their relative positions and shapes. This preliminary "feeling" procedure was intended to take the place of looking. After thirty seconds had elapsed the pieces were removed from their places and placed at random in a tray provided for the purpose. The subject was then told to return the pieces to their places as quickly as possible. "Are you ready?" he was asked. Then "Go ahead." The time for the first trial was recorded in seconds.

For the second trial, the pieces were placed in three separate piles on the tray and in predetermined order. The subject was told to begin with the left-hand pile and replace them as fast as possible. He continued to return the other two piles until all had been inserted. For the third

*High School, Turtle Creek, Pa.

trial, the subject was allowed to remove the pieces and to place them on the tray according to his own pleasure. When he had done this, he was told to "Go ahead."

Sighted individuals were also tested with their eyes open, and the normal procedure for the Witmer test was followed. The data were found to possess little discriminating value.

Testing the Blind Group

The same test was administered to the blind individuals in the Western Pennsylvania School for the Blind. The procedures adopted for testing sighted persons was followed for blind subjects. They, too, were blindfolded when there was doubt as to the extent of their visual handicap. It was thought that a partially seeing individual might possess an advantage over one without sight. In order to make it fair they were exposed to this rather ironic procedure. It is of interest to note that a partially seeing person who relies upon and uses what vision he has may be at the same disadvantage that a sighted individual suffers when he is blindfolded. In one such case his scores approximated that of sighted subjects. His aptitude for machine-shop work proved satisfactory.

Correlating the Test With Criteria. Table II is presented in comparative form to show the scores obtained by sighted boys. From these raw data correlations and graphs were developed. Table III provides similar data for the blind group.

In the literature[1] dealing with the Witmer Form Board test some doubt is expressed as to which one of the three trials gives the best results. In order to determine which one was likely to prove most successful, correlations were obtained using accuracy points and efficiency score points as criteria. How the accuracy points were obtained has been shown on pages 212 and 213 of the last issue of this magazine. A formula was used to determine the efficiency points and is a measure of accuracy, finish, and time. The formula used is as follows:

$$E = P \pm P\ sq$$

where E = Pupil efficiency as measured by accuracy, finish, and time.

P = Total points for accuracy and finish.

Sq = Speed quotient. The speed quotient may be defined as the per cent increase or decrease of 3 times the average time taken for the test job. It is the ratio of the average time on the job

$$\frac{\text{— the working time}}{\text{3 x average time}}$$

or

$$\frac{\text{The average time on the job — the average time}}{\text{3 x average time}}$$

When the average time is greater than the working time, the speed quotient is positive; but when the working time is greater than the average time, the speed quotient becomes negative.

Aptitude Test Scores, Shop Performance Test Scores, and I.Q. Scores
TABLE II. Sighted Group

	Witmer Form Board Test Scores			Shop Performance Test Scores		I.Q. Scores
Pupil	First trial time seconds	Average of 3 trials time seconds	Third trial or fastest time seconds	Performance test accuracy points	Efficiency score points	Group tests
1	508	297	44	83	91	97
2	300	163	50	76	78	—
3	286	173	60	64	52	106
4	284	170	74	66	75	—
5	476	215	80	60	65	82
6	206	141	81	66	74	98
7	235	155	95	90	105	135
8	180	138	102	77	88	90
9	251	177	104	84	90	—
10	136	143	128	54	56	77
11	327	244	131	65	66	92
12	332	219	139	88	92	120
13	320	213	149	35	38	104
14	359	242	157	20	21	106
15	415	338	291	48	46	112

Aptitude Test Scores, Shop Performance Test Scores and I.Q. Scores
TABLE III. Blind Group

	Witmer Form Board Test Scores			Shop Performance Test Scores	I.Q. Scores
Blind boys' score	First trial time seconds	Average of 3 trials time seconds	Third trial or fastest time seconds	Performance test accuracy points	Wechsler Belleview Verbal I.Q.
1	39	32	21	61	127
2	56	40	21	—	113
3	71	53	24	—	100
4	60	43	32	—	117
5	85	91	38	70	114
6	54	48	43	—	114
7	77	62	50	51	115
8	121	88	58	—	127
9	231	154	93	62	99
10	113	164	113	—	104
Blind girls' score					
1	74	52	39	—	117
2	82	59	40	—	123
3	174	126	80	—	112
4	171	190	114	—	122

Correlating the Witmer Test with Criteria
TABLE IV. Sighted Group

N		Shop Performance Test	
		Accuracy points	Efficiency points
15	Witmer Form Board test (1st trial)	.251	.188
15	Witmer Form Board test (Average of 3 trials)	.282	.251
15	Witmer Form Board test (3rd trial or fastest time)	.447	.416

The correlational data is presented in Table IV. It will be noticed that the third trial or the fastest time of three trials gave the most promising results. Because more refined correlational techniques seemed out of place, the rank difference method was used to obtain these correlations.

Graphical Analysis of Data. From these correlational data the two independent variables, accuracy points and the Witmer fastest time were plotted. This is shown in Graph I. To interpret this graph one fact should be clearly understood. The scores from 15 sighted boys, without other supporting evidence, have a limited value. Rather they should be judged in conjunction with a larger sampling. It has been mentioned previously that data have been collected for 87 boys. The mean accuracy point score for these pupils is 65.3, and the mean accuracy point score for the small sampling is 66.0. Inasmuch as the means are almost equal, the smaller sampling may be said to approximate the larger sampling in ability. The assumption

(Continued on page 250)

[1] In *A Manual of Individual Mental Tests and Testing*, Augusta F. Brenner, William Healy, Gladys M. Lowe, and Myra E. Shimberg, 1928. Published by Little, Brown & Company, 34 Beacon St., Boston, Mass.

Industrial Arts and Vocational Education

John J. Metz, Editor

THE REQUISITION SEASON

Making out requisitions may not be the most enjoyable undertaking; nevertheless, it is a necessary duty, and one which confronts the shop instructor more often than it does teachers of some of the other subjects.

Probably the best basis for an easy method of making out requisitions is a good cost-and-record system. This will furnish facts and figures that will make the problem of filling out requisitions much easier.

The "Industrial-Arts Equipment List for the Comprehensive General Shop," by F. C. Finsterbach, on page 204, of the May, 1946, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, may be of assistance to those who have to requisition materials for their own laboratory of industry. Instructors who have to make out requisitions for any type of shop may find much help in scanning through the advertising pages of this and other issues of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, and the lists of materials and equipment which appeared in the March, 1946, issue of this magazine.

Many issues of previous years also contain useful lists of tools, equipment, and materials for various types of school shops, and it may pay to look them up to make the annual job of making out requisitions easier and more pleasant.

SAFETY INSTRUCTION — HOW IMPORTANT IS IT TO YOU?

A study made by the American Association of Teachers Colleges and the National Safety Council in 1944 shows that great variations exist in the current practices of offering safety education in the one hundred and eleven colleges which submitted answered questionnaires.

Seventy per cent of the leaders of these colleges believe that safety education is as important as health education. Fifty-seven per cent think that safety education in their schools is less successful than health education.

About 70 per cent of the presidents indicated that the weakness in their safety education program was due to general lack of interest, lack of adequately prepared instructors, lack of time, no specific place in the curriculum, lack of material and equipment, and lack of specified objectives.

The foregoing shows the long road that safety education has to travel before it can be as effective as it should be. If the study pictures, as it does, the status of safety education in teacher training schools, and if, as is usually the case, the young teacher teaches as he was taught, then something drastic must be done to upgrade safety education in our teacher training institutions.

Of course, shop teaching, with its very specific dangers, helps the wide-awake instructor outline his safety-instruction material fairly well. But this very necessary course should not be left to chance. Our shop instructors should know how to teach safety on their very first teaching job, because it is their duty to teach the future industrial workers who must know thoroughly what it means to themselves and their fellow workers, if safety rules and precautions are not observed.

PREVACATION DUTIES

Now that vacation is approaching, the earnest teacher is filled with anxiety because he knows what a frightful toll of injuries and deaths may result from the unsupervised activities of carefree pupils who unthinkingly expose themselves to all kinds of dangers.

Based on the January and February death toll, the National Safety Council predicts that 1946 will have a total of 38,000 fatal traffic accidents. Many of those killed will be youngsters who are now attending school where they are kept safety conscious to some extent at least. During the vacation period they will be on their own.

Then there are the dangers that are lurking for the careless swimmer. At the beginning of every swimming season there are always a large number of drownings, because boys and girls forget that a long swim requires a great deal of strength, and that the muscles that have become somewhat flabby over winter are unable to stand up under the strain. It is well to remember that drowning is the No. 1 type of public accident. An average of 1000 persons per month from May to August is the annual toll.

Many of the youngsters will go on unsupervised hiking and camping trips. Few of them are fully informed on how to build, use, and put out campfires; how to recognize plants, such as poison ivy, poison sumac, and the like; what to do in case of sunstroke, or when someone is accidentally hurt; and yet they are exposed to these and many other dangers, and they ought to know what to do.

There is still time to prepare your students so that they are somewhat ready to protect themselves during the coming vacation days. Make use of the time that is left, for it may mean a great deal to one or more of your students to get the benefit of your vacation safety talks before, rather than after, it becomes necessary to act in an emergency.

Then there is the need to inform your students about infantile paralysis epidemics which may strike any community between early June and late September. Since medical science does not as yet know the carrying agent of the polio virus, and since no effective serum or vaccine against this dreadful plague has been found, little can be told the student on how to safeguard himself. He may be given the following precautions, however, to protect himself against the disease or to mitigate the severity of its attack:

1. Avoid chilling and overtiring
2. Do not swim or bathe in polluted waters
3. Avoid tonsil and adenoid operations
4. Wash hands before eating
5. Protect food from flies

Tell your students not to get panicky about catching the disease, or to worry about the expense of treating it if it does strike. The National Foundation for Infantile Paralysis, Inc., 120 Broadway, New York 5, N. Y., is pledged to see that no victim need lack treatment for want of funds, regardless of age, race, creed, or color.

JUST A REMINDER

The closing days of the school year 1945–46 are approaching. Have you made out an inventory of tools, machines, supplies, books, magazines, and pamphlets for your shop? Have you a place where you can store your hand tools safely, after you have protected them against rust? Have you a safe place for storing supplies and unfinished projects? Have all accounts and money matters been taken care of with the office?

Finally, be sure to leave your school keys and your summer and home address with the office.

(Continued from page 248)

to be drawn is that, if a larger group had been given the blindfolded form board test, their time scores would tend to follow the trend of the scores in the smaller sampling.

WITMER FORM BOARD TEST

TABLE V. Predicting Letter Grades from 3rd Trial or Fastest Time of Three Trials for Blind Subjects

3rd trial or fastest time (seconds)	*Estimated accuracy points*	*Letter grade*
10	82	
15	78	B
20	74	
25	71	
30	67	
35	64	C
40	60	
45	57	
50	53	
55	50	D
60	46	
65	42	
70	39	
75	35	
80	32	
85	28	F
90	24	
95	21	
100	17	

The graph also shows the blind group's Witmer time scores plotted against shop performance accuracy scores. Here again another assumption must be made. If more of the blind had managed to complete the shop test before the termination of the course, their accuracy point scores would tend to follow the trend of the sighted group's scores. As might be expected and noted in Table III the blind individuals finished the Witmer test in less time than the sighted group for the third trial. In this instance, their developed tactile sense gave them an advantage over blindfolded sighted subjects. Even so, a number of the sighted boys finished the third trial in almost the same time as the blind students. The slope of the curve, therefore, for the blind group was drawn as shown in Graph I. It will be noted that the relationship between time on the Witmer test and accuracy points appears to be a linear function. The equation for a straight line graph takes the general form of

$$y = mx + c$$

where y = Time in seconds for the Witmer test
m = The slope of the curve
x = Accuracy points for shop performance test
c = The constant

Solving equation I,

$$x = 88.7 - .714\ y$$

where x = Estimated accuracy points
y = Fastest time in seconds for Witmer test

Facilitating Table. From equation I facilitating data have been developed. (See Table V.) An example will show how these data are applied. A blind person finishes his fastest trial in 100 seconds. What will be his estimated accuracy points for a lathe test? From the table it is seen that 100 seconds corresponds to an estimated accuracy score of 17 points. The applicant would rate an F grade.

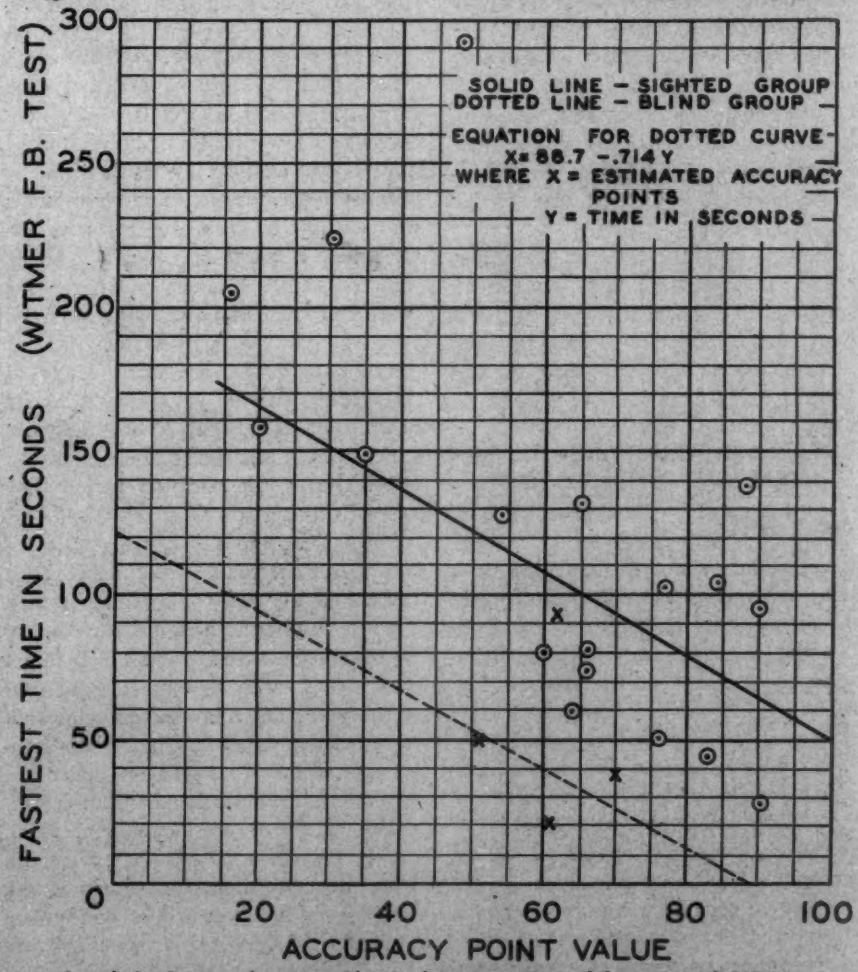
One other point requires to be clarified in connection with the foregoing table. The grades are estimated on the basis of accuracy but the performance test actually includes time as a factor. What difference in grade would exist if a student is graded on accuracy alone and what would be his grade if time is included? The data from 87 tests were used to determine the answer. The distribution of grades was computed for 87 accuracy scores and compared with the grades obtained when using efficiency scores. When both grades were placed side by side a direct comparison could be made. It was found that in almost two thirds of the cases the grade remained the same; in approximately one fifth of the cases a student's accuracy grade was raised by one grade; and in almost one seventh of the cases the grade was lowered by one grade.

To return to the afore-mentioned example — What are the chances with a predicted F accuracy grade that the blind individual, using time as a factor, will be able to change his grade? There are approximately two chances out of three that his grade will remain the same. He has about one chance in five that the grade will be higher, and one chance in seven that he will receive a lower score. Obviously, this hypothetical individual might not be a good risk for machine-shop work. It must be borne in mind, too, that the blind operator, on the basis of the present meager findings, is likely to take twice as long as a sighted subject to attain the same degree of accuracy.

It would be rash to imply from the foregoing discussion that this new application for a test be the sole determining instrument in selecting blind applicants for machine-shop training. It is offered merely to supplement other testing tools, and it is hoped it may have some service in tipping the scales one way or the other.

Conclusion

This study has been presented in three distinct though not wholly unrelated sections. Part I which appeared on pages 158,



Graph I. Curves showing relation between time of fastest trial (Witmer Form Board Test), and accuracy points

159, 160 and 161 in the April, 1946, issue of this magazine, describes some of the teaching techniques used in training blind students certain lathe operations. Because it will have become apparent that training a sighted person and training a blind subject are not one and the same thing, it has attempted to present a feasible method of approach. The need for making use of jigs, fixtures, devices, etc., has been indicated. This is not to say that the teaching techniques have been fully developed. On the contrary, only a beginning has been made, but much more remains to be done. If this study succeeds only in showing to some degree a method of attack, one objective will have been attained.

It is thought that any proposed training program for the blind should have as its core a thoroughgoing shop performance testing program. Part II, pages 211, 212, and 213 of the May issue, presents one such test. But testing the blind in some cloistered retreat without a constant check-up on the work of sighted individuals might defeat a program from its inception. There should be a "tieup" with vocational schools and time standards and accuracy scores obtained. The use to which such scores could be put might aid the work of the industrial placement specialist. Suppose a placement specialist had available objective scores for a blind trainee. He approaches an industrial personnel officer or a machine-shop foreman and says, "This blind young man on one test, or better still on a number of tests, worked to such and such accuracy and finished the job in such and such time. Sighted individuals on the same test completed the job in x time and achieved an average accuracy of so many thousandths of an inch." Surely this is the kind of language a shop foreman could understand. When a foreman knows the degree of accuracy to which a person can work he can place him on a job with reasonable hope for having the work done in the proper manner.

Part III, which is presented herewith, describes a possible aptitude test for blind candidates for machine-shop work. The blind group students had a high average I.Q., but spatial perception ability is also required for a measure of success in machine-shop practice. The evidence presented for the Witmer test is far from being conclusive; it is merely suggestive, and it is offered on the grounds that a little evidence is better than no data at all. Much work remains to be done in this direction.

In any program designed for training the blind machine-shop work the size of the class should not be overlooked. It is true that large classes make for lower unit costs, but the problems involved in training sighted students are not the same as those involved in training the blind. For example, a machine-shop teacher can demonstrate a particular operation to twenty or more sighted subjects at a time. The blind, on the other hand, require individual attention. Then, too, a blind training program as envisaged needs more than just teaching operations. It requires the experimental approach; it will need additional development work to improve the aids now in use; it will need a more refined study of time values; it will require a constant testing program; it is also essential that a machine-shop teacher keep in touch with the work of sighted groups. All of which takes time, and is not deemed to be compatible with large classes.

The feasibility of training blind individuals some machine-shop operations has been demonstrated. When suitable aids are provided they can learn to chase a thread on a lathe — a not too easy task to learn. If a blind person can be taught to perform a relatively difficult operation, then easier operations are within his ability to handle despite his handicap.

These young blind students, be it known, acquitted themselves with fortitude and courage. They deserve the opportunity, through vocational training, to become self-supporting and self-reliant members of society.

Fundamental Objectives of Industrial Training

*R. B. Cribbs**

In the past few war years America has proved her right to the title of the most highly industrialized nation in the world. There have been many contributing factors to this industrial record but no one can deny that vocational education has played an extremely important role. It takes brain power, skill, and human energy to achieve such results and vocational education concerns itself directly with these values.

If we are to maintain the high standards of living which the American workman has earned, we must continue to pay high wages — the only possible way to do it is to increase production per man hour. We can accomplish this if we strive constantly to improve our operating methods and continuously train our work force. This is the challenge to the "gold dust twins" of vocational education.

The school twin of vocational education must continue to prepare people for effective work and the industrial twin must encourage effective work and expand the opportunities for improvement in it.

The purpose of this article is to assure our friends in the school phase of vocational education, that we in industry are accepting the challenge and we want to acquaint you with the objectives of our industrial training. If we have a better understanding of mutual goals and objectives we stand to improve our working relationships.

Advantages of Organized Training

Organized industrial training is not new but it has gained its greatest impetus in the past four years. More and more industrial concerns are turning to organized training because they realize the advantages it holds over the old "hit or miss" type. It raises the standards of workmanship and better prepares men for the future responsibilities. It also gives direction and control to our educational program and provides the strategic initiative which is entailed in knowing exactly where we stand. Beyond that, it provides an open door for the school groups to work more effectively with industry.

Industry hopes to retain these advantages through a constant attack on the objectives of industrial training — the over-all purpose of which is to increase efficiency throughout the industrial plant.

Proper Use of the Line and Staff Organization

The line-staff organization is the circulatory system of industry. Just as production orders flow through it, so also must we direct our educational plans and efforts. The definite purpose of the organization is to increase efficiency and reduce errors. However, because of the large number of people involved and the limitless number of details, there is the greatest possible chance for errors within itself. Our first goal in industrial training then is to acquaint the organization with its responsibilities and thus attempt to reduce the

*Personnel Manager, Gerber's Baby Foods, Fremont, Mich.

number of errors. It must accept as one of its first duties — the development of men. Unless it does so, our hope for promoting efficiency is useless.

Industrial training must begin with our executive group. The executive is charged with the responsibility of seeing to it that the organization chart is followed. He must realize that he is dependent on his organization for getting the work out and he therefore must do all in his power to strengthen his productive group. We must assist him in four areas: (1) communication, (2) technical knowledge, (3) human relations, and (4) personal adjustment.

The line supervisor is the link between top management and men. He must interpret policies and orders and handle the many problems which he is heir to. We must do all we can to help him with his problems. His greatest assistance should come from the executive above him. In turn he can lend a hand to his job trainers and the people who are turning out the work.

The job trainers must understand the importance of educating new people on the job. They should realize also that their position provides a training ground which will prepare them to assume future supervisory responsibilities.

The staff department members must be made to recognize that their first obligation is to assist the line organization wherever possible. Their duties are chiefly advisory or research in nature. They are useless without the supervisors co-operation — with it they can render invaluable timesaving service.

A smoothly operating line and staff organization is vital to our efficiency potential. Unless it performs its function correctly, we can't expect to control or improve the efficiency of our work group.

Better Use of Man Power

Few people ever use their capabilities to the maximum extent and we contend that an improved use of man power is always possible. Consequently we feel that a never ending drive to make better use of man power should constitute another of our major objectives. This doesn't mean that we should prod and force our men to do more work, rather we should strive to exercise sound techniques of individual development. Through them we can stimulate in our people the desire to use latent abilities and enthusiasms on present and future assignments.

There are many methods which can be used to help us attain this goal. Some of the basic ones are:

1. Proper orientation
2. Complete job instruction
3. Full explanation of company policies
4. Supplemental group instruction
5. Upgrading opportunities
6. Personal contact with supervision
7. Employee service activities
8. Careful job placement
9. Upgrading within seniority limits, etc.

Because of normal turnover, increase in force, reduction in force, etc., we can further control our use of man power through planing for these adjustments. Having many people trained on all jobs is one of our best solutions. This is relatively easy to handle when we know what our needs are. An organized training plan helps us to co-ordinate all of these many phases. If our line organization is functioning effectively and if we are making progress with the man-power program, we will be well on our way toward improving the efficiency we desire.

Attack Specific Problems

Even though we may be doing a good job in these areas, we will find that there are many special problems which need specific attention. We know, for example, that industry must do everything possible to reduce its operating costs to a minimum. Inadequate attention given to this item might inevitably lead to loss of profits, jobs, and wages. Specific training at both management and worker levels can definitely provide preventative and corrective treatment.

If our employees understand the importance of costs and how each job operation and action effects them, they may be less likely to indulge in wasteful habits. We must constantly train our line organization to educate its people to be cost conscious — this is our main preventative measure. However, when excessive costs do appear we can analyze the cause and make positive plans to correct the situation. Many times an informal conference or group of conferences will help us over the hump. Most men have sound ideas on matters relating to their jobs and we only need to provide the opportunity for their expression. Out of such meetings are developed new records, methods, use of materials, safety practices, etc. Since the industrial scene is a changing one, the need for this type of training is always present.

Promoting and Expanding the Human Relations Factor

For our fourth major objective, we seek to strengthen the human relationships within our organization. This can best be done through practicing regularly and persistently the techniques which we use to attain the other objectives. Through these measures we are setting the pattern for working constructively, co-operatively, and efficiently with all employees and thus helping to establish the bond between management and men which is so badly needed today.

The cornerstone of this bond is made up of the understanding, fairness, recognition, mutuality, confidence, and respect which is born of close personal contact between our basic groups. This is the very foundation of sound labor relations. We can't develop morale and enthusiasm in, nor can we properly discipline our work force through spectacular methods — we need the simplicity and common sense applications which we have attempted to outline.

Morale and enthusiasm is built on job satisfaction and positive attitudes. These can be stimulated through our keeping pride of craftsmanship and self-respect alive in our individual employees.

Through our instructions and explanations we hope to educate our people on the fundamental patterns of acceptable behavior. If we can instill in them a desire to conform, we will minimize the necessity for administering negative discipline. Further control can be exercised through the attention which supervision gives to such items as poor aptitude, emotional disturbance, physical limitations, and personal problems.

We have tried to point out that we are not oblivious to our responsibility for developing the individuals who comprise our personnel and, further, we have a definite pattern for accomplishing the purpose.

To summarize: We are attempting to make desirable impressions on the thoughts, skills, and actions of our people through practicing the fundamental techniques which will enable us to: (1) improve the line-staff organization, (2) make better use of man power, (3) attack specific problems, and (4) promote and expand the human relations factor.

There are many ways in which the schools can make the task easier for us. First, they can strengthen the leadership in the shop and classroom so that the students will be able to make the right adjustment to the help and control which our line-staff organization provides. Second, they can equip the students with the basic skills which will be of greatest help on our man-power problems. We can work together to determine what these skills are. Third, they can aid us with our specific problems. In organizing and administering all programs of a vocational nature, they can be of immeasureable assistance through placing their experience at our disposal, and fourth, if they will work closely with the individual members of their groups, they may help to minimize some of the personality difficulties which students bring to industry.

It is evident that vocational education has a huge responsibility to industry and the community but it has made great progress in recent years. The next decade will be vital to our way of life and we must recognize the importance of the part we play in it. Let's not lose the ground we have gained.

A major ill of the patent system is the issuance of patents which are found by the courts to be invalid. Many such patents should not have been issued.

To remedy the situation, American industry urges that the staff and facilities of the patent office be enlarged so that claims of invention by patent applicants can be adequately studied and patents issued only on developments which are really new and worthy of patent protection. — *Robert Gottschalk*, Chicago Patent Lawyer.

Aeronautics

*William E. Nagel**

Not many outlines or courses of study have been written for use in the average small rural high school aeronautics class.

For the past two years the accompanying course of study has been used in the aeronautics classes at Washington Community High School, Washington, Ill. The enrollment in this school is just over two hundred students. This course must compete with physics and chemistry, the usual science classes for juniors and seniors. A limit is also placed on enrollees by requiring physics, or current enrollment in a physics class as a prerequisite. This ruling is sometimes relaxed where the superior scholarship of a student merits it. A suggestion has been made to hold this class in alternate years so that the full benefit of all three (physics, chemistry, aeronautical science) classes would not compete too heavily due to the limited enrollment of the junior and senior classes in a high school of two hundred students. The enrollment in the aeronautics class, however, has not suffered due to this competition as the students seem eager for subject matter of this type.

The work in this course is carried on in three forms — laboratory, workshop, and regular classroom recitation and discussion.

Through the Reconstruction Finance Corporation much equipment has been purchased. As the area we have for classroom use was too small to accommodate a complete airplane, we have settled on small assemblies or individual parts. Thus far we have two engines, a hydraulic landing gear and wheel assembly, about twenty instruments, carburetors, magnetos, navigation instruments, propeller, starters, and wing and tail sections. Besides this equipment several films have been purchased from The Jam Handy Organization,[1] and we have four wall maps for use in the meteorology unit.

The board of education agreed to an expenditure of $150 to set up the course. This included the purchase of twenty textbooks, and also a supplementary library of about fifty books and pamphlets. Then a later expenditure of approximately $125 was authorized, thus permitting the purchase of the equipment just mentioned.

The class enrollment has been opened to both boys and girls. The girls seemed somewhat opposed, at first, to the workshop portion of the units but this course gave the girls the first opportunity in our school history for participation in any type of shopwork. This in itself was cause enough for any backwardness, because they have now entered into every undertaking very wholeheartedly. The textbook used is Pope and Otis' *Elements of Aeronautics*,[2] and a workbook, Drake's *Workbook in Pre-Flight Aeronautics*, Macmillan Company,[3] 1943, also is used. The following bibliography has been used to compile the course of study:

1. *Air Age Education Series*, "Elements of Pre-Flight Aeronautics for High Schools" (New York: The Macmillan Company.)
2. *Aeronautics for High Schools*, "Science of Pre-Flight" (New York: The Macmillan Company).
3. "Globes, Maps, and Skyways" (New York: The Macmillan Company).
4. *Air Age Education Series*, "Education for the Air Age" (New York: The Macmillan Company).
5. "The Biology of Flight" (New York: The Macmillan Company).
6. "Geography in the Air Age" (New York: The Macmillan Company).
7. "The Air We Live In" (New York: The Macmillan Company).
8. "Aeronautics in the Industrial Arts Program" (New York: The Macmillan Company).
9. "Physical Science in the Air Age" (New York: The Macmillan Company).
10. "Mathematics of Air and Marine Navigation" (New York: American Book Company).
11. "American Practical Navigator," United States Hydrographic Office, Washington, D. C.
12. "Navigation and Nautical Astronomy," United States Naval Institute, Annapolis, Md.
13. "Elements of Aeronautics" (Yonkers, N. Y.: World Book Company).
14. "Before You Fly" (New York: Henry Holt and Company).
15. "Air Pilot Training" (New York: McGraw-Hill Book Company, Inc.).
16. "Principles of Aircraft Engines" (New York: McGraw-Hill Book Company, Inc.).
17. U. S. Department of Commerce, Bulletin No. 27, "Pilots' Airplane Manual," Civil Aeronautics Administration, Washington, D. C.
18. U. S. Department of Commerce, Bulletin No. 26, "Aerodynamics for Pilots," Civil Aeronautics Administration, Washington, D. C.
19. U. S. Department of Commerce, Bulletin No. 24, "Practical Air Navigation," Civil Aeronautics Administration, Washington, D. C.
20. U. S. Department of Commerce, Bulletin No. 28, "Pilots' Powerplant Manual," Civil Aeronautics Administration, Washington, D. C.
21. U. S. Department of Commerce, Bulletin No. 5, "Flight Instructor's Manual," third edition, Civil Aeronautics Administration, Washington, D. C.
22. U. S. Department of Commerce, Bulletin No. 22, "Digest of Civil Air Regulations for Pilots," seventh edition, Civil Aeronautics Administration, Washington, D. C.
23. U. S. Department of Commerce, Bulletin No. 23, "Civil Pilot Training Manual," second edition, Civil Aeronautics Administration, Washington, D. C.
24. U. S. Office of Education, Leaflet No. 63, "Pre-Flight Aeronautics in Secondary Schools," United States Government Printing Office, Washington, D. C.
25. U. S. War Department, Training Manual 1-233, "Elementary Physics for Air Crew Trainees," United States Government Printing Office, Washington, D. C.

Course of Study for Aeronautics

I. Objectives of the Course
II. Three Dimensional World
III. Aircraft Structures and Identification
IV. Aerodynamics
V. Power Plants
VI. Meteorology
VII. Airplane Instruments
VIII. Nautical Astronomy
IX. Avigation
X. Communications
XI. Civil Air Regulations

UNIT I

Major Objectives for a Course in Aeronautical Science

As a preliminary statement, the writer does not believe in making a large list of objectives for a course and only being able to fulfill a part of them; or worse, to be able to only hurriedly pass over the entire group. He favors the setting forth of a few objectives that can be reasonably accomplished, and then concentrating on them. As needed, new ones can be added each year until a mature teacher will have a program of which he can well be proud.

Any objectives should be thought of as teacher's objectives and not as objectives of general education or of aeronautical science.

With this as a background, the writer presents the following objectives of his course of study:

1. To develop in each pupil an active interest in aeronautics leading perhaps to eventual personal participation in aviation.
2. To develop in each pupil a basic understanding of the scientific and mathematical principles encountered in the field of aviation.
3. (*a*) To develop in each pupil the prerequisite social concepts and attitudes that are made necessary by aviation.
   (*b*) To develop in each pupil a deep personal concept of geographical concepts as related to aviation.
   (*c*) To develop in each pupil an understanding of economic concepts and principles that are made necessary by the air transportation industry.
   (*d*) To develop in each pupil an understanding of political concepts necessary to meet the international attitude that aviation forces upon the public.

The basis for these objectives is in the main a pamphlet, "Aviation Education for Illinois Schools," printed in May, 1944, by the Educational Press.

The following outline is based upon these objectives.

(To be continued)

*Washington Community High School, Washington, Ill.
[1]2900 East Grand Blvd., Detroit 11, Mich.

[2]World Book Co., 313 Park Hill, Yonkers-on-Hudson, N. Y.
[3]Macmillan Co., 60 Fifth Ave., New York City.

Grading the Shop Student

*Frank J. Gavlak**

Giving a shop student a grade on the same basis as that used for other classes is sure to present some difficulty. In all fairness to the shop student, a means must be devised to transfer several requirements into a single numerical grade. The academic phase alone plays only a limited part in determining a shop grade while it may be the sole factor in other classes. Shopwork must in addition be evaluated with a practical grade.

The shop student is constantly dealing with equipment. He must be graded not only on what he has learned and its application in the shop. He must be given credit for his natural adeptness. Dexterity varies with individuals and consequently some become more skillful than others.

Precision and also relative time spent in accomplishing the prescribed job must be taken into consideration. A job only "half done" is definitely not a job well done. The "efficient" worker is one who has accomplished his job with all due skill and accuracy, and in a minimum amount of time.

*Ordnance School Bn., Aberdeen P.G., Md.

It has been often said that a good worker with poor tools will still produce a bad job. Therefore, care of equipment, which includes such matters as cleanliness, proper adjustment, and control, cannot be overemphasized as a means of judging the student.

Finally, and not to be overlooked, is the factor of safety. A worker is of little value to his employer and himself if he is careless with equipment. He not only creates a possibility of deranging his physical construction, but also ruins tools and machinery and thus decreases his chances of producing better work.

The accompanying form is used to evaluate the practical side of a student's achievements in a shop class. By it the worker can be judged on the basis of all the requirements previously outlined.

First, each factor is rated separately. Divisions are provided for a wide range of scores. Each score is briefly explained to show its requisites or limitations. Second, all items are summed up, and a total is obtained which may fairly be considered a good practical grade.

SAFETY QUOTATIONS

Coal mine deaths totaled 1034 in 1945. This was 17 per cent fewer than were reported in the same months of 1944. — *National Safety Council.*

Rural traffic deaths increased 24 per cent in 1945. Rural deaths were 60 per cent of the total traffic toll in 1945. — *National Safety Council.*

One out of every 13 persons suffered a disabling injury in 1945. — *National Safety Council.*

On the basis of ten years' experience, Kansas State Board of Health records show that machinery, excluding motor vehicles, was involved in 30 per cent of all farm work fatalities. — *National Safety Council.*

Pedestrian deaths in 1945 numbered 11,200 — 14 per cent higher than in 1944. — *National Safety Council.*

More American lives were lost in motor vehicle accidents in 1945 than were lost during the past 75 years in 36 major disasters resulting from fire, flood, storm, earthquake, and explosion. — *National Safety Council.*

Forty-three per cent of all injuries in school buildings were to children in the seventh through the ninth grades in school systems reporting to the National Safety Council during 1944–45, although these children make up only 24 per cent of the total enrollment. — *National Safety Council.*

SHOP GRADE

Quality of Work Accuracy, precision of actual operations performed	Much below quality requirements	A little below quality requirements	Just meets quality requirements	A little better than quality requirements	Much better than quality requirements
Application of Classroom Principles Ability to apply to his work what he has been taught in class	Makes no use of classroom principles	Uses some of the classroom principles	Applies the average number of classroom principles	Makes use of nearly all classroom principles	Applies all classroom principles
Manual Dexterity Skill in use of hands	Very poor use of hands. Clumsy. Can't co-ordinate mind and hands	Below average ability in the use of hands	Has average amount of ability in the use of hands	Above average in the use of hands	Excellent in the use of hands. Very agile. Excellent co-ordination of hands and mind
Selection, Use, and Care of Equipment Safety, cleanliness, proper adjustment and control of equipment	Continually misplaces equipment. Incorrect selection or adjustments. Dangerous worker.	Usually spoils equipment or makes poor selections and adjustments. May take careless chances	Just meets requirements of safety selection and adjustment of equipment. Seldom takes chances	Usually careful about equipment. Selects and adjusts well. Takes few chances	Conserves materials. Always careful about equipment. Excellent selection and adjustment. Takes no chances
Time Relative time spent completing his operations	Much behind time requirements. Slow worker	A little behind time requirements	Just meets time requirements. Average speed	Finishes a little sooner than required	Finishes sooner than time requirements

Quality of work _____
Application of classroom principles _____
Manual dexterity _____
Selection, use, and care of equipment _____
Time _____
Total _____

Student's name _____ Class No. _____

Signature of Instructor _____

Grade card designed by Frank J. Gavlak

Industrial Arts Promotes Mental Health

*Rufus Jacoby**

Good mental health is the condition in which the individual can live happily with himself without disturbing or offending others.

It is estimated that over a million of the present school population will need treatment in mental institutions for lack of this state of mental health. One of the casualties of war was the child deprived of the guiding and controlling influence of the father called to the armed forces, and of the inadequate care of the mother who was working to support herself and the child. Children, constantly moving from place to place, lack a sense of security and belonging which is so essential to their normal development. Studies of child development indicate that basic personality and character patterns, habits, and ideals are permanently established by the age of six.

Industrial arts is a phase of general education which provides experiences enabling the pupil to understand his industrial environment, to test his interest and ability in industrial occupations, to express himself creatively in industrial materials, to develop good habits of attacking and executing jobs, and to develop a true concept of beauty, form, and workmanship in the products he consumes.

"Learning by doing" is basic to the industrial-arts laboratory. This was the theory advocated by Rousseau when he said: "Emile will learn more by one hour of manual labor than he will retain from a whole day's verbal instruction." Pupils learn best when actively engaged in doing the thing they are thinking about. Learning takes place through the ear, the eye, and the hand. Industrial arts stimulate creative thinking and activity, providing for self-expression by making useful objects. Industrial arts provide experiences in creating, planning, criticizing, analyzing, and evaluating.

Intelligent citizenship requires a knowledge of modern technology and industry, its organization, problems, and products. Industrial arts enrich the curriculum by providing experiences with tools, machines, materials, and products, as well as industrial information, good work habits, desirable attitudes, avocational interests and skills.

Industrial arts provide an activity in the curriculum in which maladjusted students may initiate more normal scholastic and social adjustment through release from fear, anxiety, tension, and the sense of failure. The teacher must stimulate desirable adolescent experiences in responsibility, co-operation, and group activity in which each student will have a feeling of success. The satisfaction of a purposeful manual activity and skill may provide compensation for a sense of inadequacy in other school subjects.

Tests show that working with one's hands reduces tension and emotional strain. Manual activity reduces mental fatigue rapidly. Many persons have too much mental, and too little physical activity to be well-balanced individuals. The doodling of the executive while telephoning is an indication of the need for creative activity.

To be well balanced the individual must get away from himself by finding interests outside himself. Everyone should have the skill to take himself away from himself. Industrial-arts activity requires mental and muscular co-ordination which results in one's thoughts passing from oneself to the processes, techniques, and products. This physical activity is a basic body need. Lifting, pushing, pulling, and bending tones up the muscles and furnishes emotional release.

The timid, uncertain pupil may be helped to find a means of expression and a sense of personal achievement through the production of an article of beauty and utility.

The industrial-arts teacher should encourage his pupils to carry on work after school, and engage in such things as research, making designs, visiting shops and stores, make reports of such elementary home workshop activities, and the like. Teachers should insist that every job started should be carried through to a satisfactory completion.

The use of leisure time is a postwar problem. The person who has a skill has no leisure problem. The skill may be making furniture, collecting various types of things, gardening, tinkering with machines, home mechanics, music appreciation, or sports. Industrial-arts activities provide experiences and skills in design, appreciation, and manual dexterity in the use of tools.

Much juvenile delinquency would be prevented by the development of some kind of skill in adolescence. When an educator who followed John Dillinger through school was asked: "What is wrong with Dillinger?" he answered: "Dillinger developed no skills in school, could not play ball or co-ordinate hand and eye in any activity, couldn't fit into any school activity; thus he never learned the rules of the game or how to get along. Dillinger thus drew up his own rules of the game in which he was temporarily successful, killing and destruction" (address by Dr. Carroll R. Reed).

Benjamin Franklin, the statesman, philosopher, and printer, advocated that every person, regardless of intellectual attainments, should have a trade.

The industrial-arts teacher has exceptional opportunity to observe the pupil acting as his real self in the informal shop atmosphere. Pupils are free to express feelings, emotions, and ideas, thus permitting the teacher to observe their weaknesses and strengths of personality. The teacher should be prepared to set up situations which tend to correct emotional and personality weaknesses. Pupils also express their adjustment in their world by balance, rhythm, and sense of symmetry of their designs and in the execution of their work.

Industrial arts has a place in occupational therapy in mental institutions by providing a technique to get the patient started in constructive activity. Frequently no conversation can be carried on with the patient because of his deranged mental processes. Occupational benefits can go on without conversation. Some benefits claimed by therapists, through the industrial-arts approach are: (1) it provides a release for pent-up energy and feelings; (2) it takes the patient's thoughts from himself to materials, processes, and techniques; (3) it gives the patient a sense of achievement and recognition; (4) it takes the patient's mind off his illness and improves his general health; (5) it provides worth-while goals through normal activity.

Industrial arts has a place in the occupational therapy programs in hospitals, its physical function being to improve muscle, strength, and movement. In the modern program there is a dual objective: (1) muscle and joint rehabilitation and (2) occupational rehabilitation. Examples of methods are:[1] (1) machine assembly with screws, for wrist twisting movement; (2) winding wire coils for elbow movement; (3) assembling small parts with bolts and nuts for finger dexterity.

*Coolidge High School, Washington, D. C.

[1]Alden Stevens, "Here's Hope for War Wounded." *Survey Graphic*, May, 1944, p. 165. *Reference:* J. E. Davis, *Employment Is Nature's Best Physician*, and *Hygiea*, April, 1942, pp. 268–269.

DANGEROUS TRAFFIC HOURS

From 6 to 8 p.m. are the most dangerous traffic hours for drivers and pedestrians according to the data gathered by the National Safety Council.

Despite wartime driving restrictions, 2050 school age children were killed in motor vehicle accidents in 1944. One hundred and ten thousand school age children were injured by motor vehicles last year. —*Safety News.*

Plastic Resumé

*G. Harold Billingham**

Parkesine, a brownish-blue colored material produced in 1855 by A. Parkes, was the forerunner of celluloid (plastic material made from nitrocellulose). Parkesine was used for making colored buttons, plaques, combs, and doorknobs. Laminated patterns of celluloid also were displayed in an exhibition around that date.

Plastics production through the years to 1940 increased 2000 per cent. However, war needs have doubled this output in the last five years, a recognition that anticipates still further development. Plastics have their possibilities and limitations. Good design is the result of knowing these factors. The decision may rest upon the extent to which the material required meets many combined specifications.

Plastics have been tried out in many school shops due to wood and metal shortages and the latent research abilities of those in charge. The adaptability of this material to available equipment, the ingenuity of shop instructors, and the pleasing results with practically no waste, have done much to secure a permanent place for these products in the school shop field.

Plastic craft also is one of the most popular recreational activities in Red Cross and Army centers, with increasing possibilities in rehabilitation programs.

Rings, jewel boxes, trays, vases, charms, nut bowls, fancy dishes, letter openers, and frames have been designed to fit the stock forms now available.

One manufacturing problem has been to hire workers who have the feel and sense for handling these fine materials. Schools may be the medium that will give the prospects a working knowledge of plastics, if only to weed out those, who without this experience, would seek employment in this field.

Any fine tooth saw, except a ripsaw can be utilized in the cutting processes. Cement joints do not show, and the cement sets in two hours. In 48 hours it is as hard as the material itself.

Temperatures between 200-300 deg. F. give the sheets a gelatin appearance. In this condition they can be placed over a mold and held until cool. Light cotton gloves are ample protection for the hands. The heating medium can be hot water or oil, although dry heat is recommended. This can be supplied by an oven, roaster or similar accessory.

Plastics may be turned on a lathe, while held in a chuck, glued onto a face plate board, or in especially designed holding devices. Slow speeds (as required for soft metal), sharp tools, and a light touch are prerequisites for satisfactory results.

William N. Dudley of the Nicholson File Company is the author of important information on the selection and use of files in the shaping and finishing of plastics. (INDUSTRIAL ARTS AND VOCATIONAL EDUCATION MAGAZINE, page 18A, May, 1945.)

Buffing with pumice or rouge, produces the high polish. Care must be taken to avoid scorching. Results can be obtained with almost any fine abrasive compound, scouring powders included, using hand or power methods.

Costs are about three times the price of glass, or slightly more than copper. Plastics, like hard drawn copper, have an extremely limited range in which they are truly elastic. Their cost may be justified by classifying them with the finer type of workable materials.

Six years ago 280 colors were available. Now there are over 4000. There are about 90 different types of plastics.

This versatile group of materials will receive serious consideration in this postwar era, not as substitutes, but as materials for which important consumer uses have been developed. Packaging, for instance, is making extensive use of it already for wrapping vegetables, meats, cakes, fruits, cosmetics, flowers, hats, valuable papers, and the like. Fillers for cloth, and for use in felt hats, leather shoes, and dental fillings, are already past the tryout stage. Hundreds of uses developed by the war department will be made available to civilians, a partial return on our huge war costs.

Some commercial developments are:

Plastacele (cellulose acetate) sheets, molding powders; surface hardness compares with that of aluminum and copper, slow burning. Transparency reduced by surface marring. (Pull-type circular saw advised for straight cutting.)

Pyrolin (cellulose nitrate). Sheets, rods, tubes. Strong, durable, easily cemented. Hammer heads, tool and brush handles.

Polythene (hydrocarbon resin). Waxy white, translucent. Good chemical resistance, electrical properties. Wire and cable insulation, molded electrical parts. Among lightest of plastics.

Butacite (polyvinyl acetal resin) *sheets*. Shatter-resistant, transparent. Laminated safety glass.

Lumrith. Waterproof, grease proof. Pencil marks can be made and erased many times. May be used to keep wallpaper bright.

Lucite (methyl methacrylate). Introduced to the public about 1937, has strength, toughness, and ease in forming and fabrication. Crystal clear, light in weight, resistant to sunlight and exposure to weather. Sheets can be readily cut, drilled and bent without cracking, and softened at temperatures between 190 F. and 240 F.

Plexiglas. Called "plastic with a memory" because when reheated returns to its original shape, is pliable as putty when exposed to heat. No dies or forms are used. The material is blown or sucked into shape to form such products as oxygen tents, and plane domes and blisters. Its clarity stresses its importance in the sick room where opaque apparatus adds to fear.

Synthane. These technical plastics have high dielectric strength, low moisture absorption, corrosion resistance, compressive, tensile, flexal, and impact strength. They are stable over a wide temperature range. This group is made by applying heat and pressure to paper or fabric, impregnated with resins. About half as heavy as aluminum, lighter than magnesium, and about one third as hard as annealed cast iron, their reaction is about the same under varying temperatures as alloyed aluminum. Pure aluminum, copper and brass have a slight advantage for this specification. Production is in sheets, rods, tubes, fabricated parts, molded-laminated, molded-macerated. Products include pulleys, bearings, structural members, scales and dials.

The family of Monsanto Plastics includes:

Nitron (cellulose nitrate). Tough, strong, dimensionally stable. Limitless range of colors. Sheets, rods, tubes, special shapes, largely used for mechanical fabrication into finished form.

Fibestos (cellulose acetate). Tough, strong, colorful, sheets, rods, etc. Also for molding compounds. (Heat and pressure gives final form.)

Lustron (polystyrene molding compounds). Extra light, dimensionally stable, electrical qualities, appearance values.

Resinox (phenol-formaldehyde resins). Powder or liquid form, with various fillers. Compounds are strong, heat resistant, good electrical qualities. Supplied also for bonding other materials.

Resimene (melamine-formaldehyde resins). Powder, liquid—used for bonding. Resistant to heat, water, and chemicals. Unlimited color range. Excellent electrical qualities.

Vinyl Acetals (rubberlike resins). Molding compounds. Transparent, translucent, opaque. Sheets or rolls. Also special bonding resins. Special "dopes" or sheets for "rubberizing" fabric.

The general public is acquainted with

*High School, Weehawken, N. J.

the polymeric materials known as nylons, which vary widely in physical and chemical properties, as hosiery, tooth and hair brushes, surgical sutures and tennis rackets. Nylons can be adapted to standard operations of extrusion, compression, and injection molding. Resistance to operating temperatures that distort other thermoplastics, enlarge their field of application. Nylons fluidity at time of injection, for example, makes slide fasteners possible. Molded pieces are desirable for their mechanical properties, not appearance.

Low heat conductivity means that even at low temperatures, articles can be handled without discomfort or danger. This property adds a wide range of uses to plastics in certain groups.

Loading tests, flexural, compression and tensile, ordinarily applied to materials, measure strength, but not resistance to shock. Glass is classed as strong, rubber as weak. However, under shock, glass is brittle, rubber tough. The impact strength of plastic is affected by moisture and temperature.

Carbon is the principal buildin" block of the long chainlike plastic molecules, and is indispensable, but carbon compounds are susceptible to heat. Experiments to offset this factor have produced the "silicones." Silicon found in sand and quartz and one of the most abundant elements on earth is far less sensitive to temperature and gives this merit to a plastic. The silicone thus uses silicon and oxygen, instead of carbon. Silicone rubber, although having the appearance of salt-water taffy, is not sticky and bounces like a ball when dropped. Some samples are brittle, others can be stretched. Its low tensile strength excludes it from the tire producing field. Properties including withstanding heat, sunlight, and corrosive chemicals give silicones consideration for paints and enamels. Since this family of synthetic resins is produced in all stages from a gaseous to a solid material (vapor, watery liquid, thick oil, pliable rubber), its possibilities also include product vapor treatment, and greases that do not harden at 40 below 0, or melt at 400 above.

Interesting uses of plastics include:

Paint brushes: Tapered bristles, no sterilizing, sorting or blending, mothproof, don't dry out.

Dimout screens: Blue, amber, etc. Light intensity reduced.

Hospital face masks: Tongue depressors, vials.

Underwater headgear: Used at depths of 320 feet. In use while the "Lafayette" was righted.

Drinking tumblers: Ejection molded, heat treated.

Purple heart medal backgrounds. (This medal first authorized by Washington in 1782.)

Drip pan: Hydrolic oil. Unaffected by vibration, resistant to oil.

Hammer heads: Do not chip, break, or mark soft metals. Do not absorb water, oil or grease.

Fishing leaders: Do not fray, split, roughen, or become brittle.

Chemistry test paper holder: Inert to chemical ingredients. Clarity for accurate color comparison.

Contact lenses (unseen eye aids) (acrylic plastics): Do not fog or smear.

Golfing tees: Glow brilliantly in sun's rays—loss reduced.

Battery case: Rechargeable battery. Cell constructed in 5 individual parts. (Molded—1 injection, in same die.)

Tank compass: 33 plastic parts cut the weight 7 pounds.

This experiment met with so much enthusiasm that it will probably become a fixture in our school program.

Problems and Projects

SPOT WELDING TECHNIQUE

RALPH E. STUCKI

Dana Junior High School

San Diego, Calif.

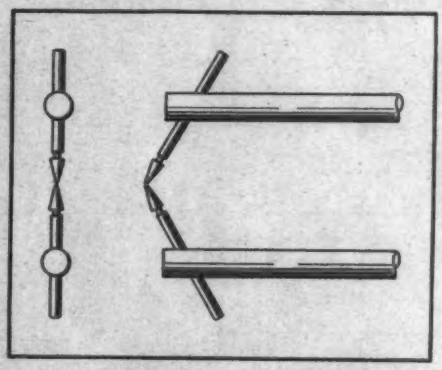
Spot welding is one of the newest industrial processes developed in metalwork. In keeping with this modern trend, school shops are obtaining spot welders in order to help the students become acquainted with the skill. A reading of this article will show that there is more to spot welding than merely pressing the foot pedal.

A good spot weld should be from 3/32 to 5/32 in. in diameter and from 1/32 to 3/64 in. in depth. There should be no burr sticking out from the edge of the spot.

The correct diameter of the spot is easily obtained by filing the tips to this diameter with a bastard cut file and then smoothing them with abrasive cloth.

The depth of the spot is regulated by the timing or the length of time the trip is held with the current running through the tips. Most welders have regulators for the current and timing. While these are satisfactory for the very inexperienced, the more experienced operator will be able to recognize good welding by the sound of the tip sinking into the metal and will time the trip action to whatever time is necessary to heat the metal.

The third and equally important qualification of a good spot weld is that there is no burr on the edge of the spot. There are several things that may cause such a burr to form, and one or all may happen at the same time.



Welding tips correctly filed

1. The tips must have a long point, so that the burned metal can fly off without sticking to the edge of the spot and cause a burr. This is obviated by filing the tips correctly.

2. The tips must align both from the front and from the side. This is most easily tested with a piece of metal. Slip the metal between the tips and apply full pressure. If the metal is straight, the tips are in alignment.

3. The pressure may not be correct. To set it correctly see that the rod which is inside of the cabinet and operated by the foot pedal lacks from 1/8 to 1/4 in. of touching the switch when the tips touch each other. The tips are adjusted by sliding them up or down as desired. If the pressure is not correct, there will be a profusion of sparks caused by the current coming through the metal before there is pressure.

4. Keep the tips smooth by pulling a strip of abrasive cloth back and forth over each tip.

DOUBLE COIL BUZZER

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High School of Science

The Bronx, New York City

The double coil buzzer described in this article was designed and constructed by Barry Henning. It is a useful project which can be built very easily, and it demonstrates clearly what one can do with electromagnets. It may be used as a buzzer, or to convert direct current into interrupted direct current.

To study electromagnets, one must know first how to construct an electromagnet.

Things to be known about electromagnets:

1. The more turns of wire on the soft iron core, the more powerful will be the magnet. See Figure 1.
2. To tell the polarity of an electromagnet, apply the following rule. See Figure 2.

The Right-Hand Thumb Rule

Grasp the coil in the right hand with the fingers pointing the way the current is flowing. The end where the thumb points will be the north pole.

The buzzer is constructed with a double coil. When using a double coil it is important that it be wound correctly; otherwise, the electromagnet will be inefficient. See Figure 3.

The *base* of the buzzer is made of wood which may be salvaged from fruit boxes. The size of the base is ¾ by 3 by 5 in. The base must be cut to size, chamfered, and then sandpapered. To be accurate, draw the center lines so that all parts will line up. Locate and drill all holes. See Figure 4.

The *armature* and the *contact point*, shown in Figure 5, are made of bright tin or black iron. If the parts are to be made of tin, the metal may be obtained from tin cans. Draw center lines on all parts. The holes may be punched or drilled. The parts are easily shaped in a vise or with a pair of pliers.

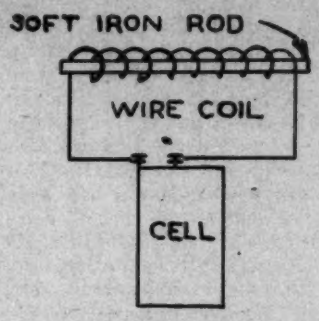

Fig. 1. The electromagnet

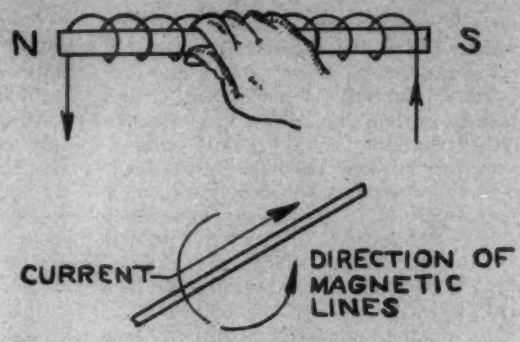

Fig. 2. The right-hand thumb rule

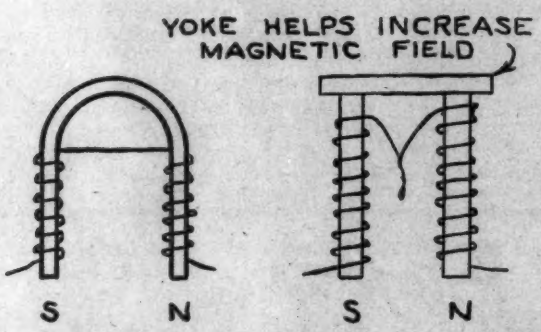

Fig. 3. Winding the magnet. See Fig. 4 on page 259

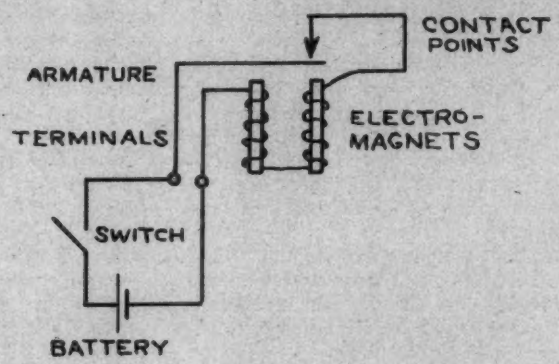

Fig. 6. Diagram of buzzer

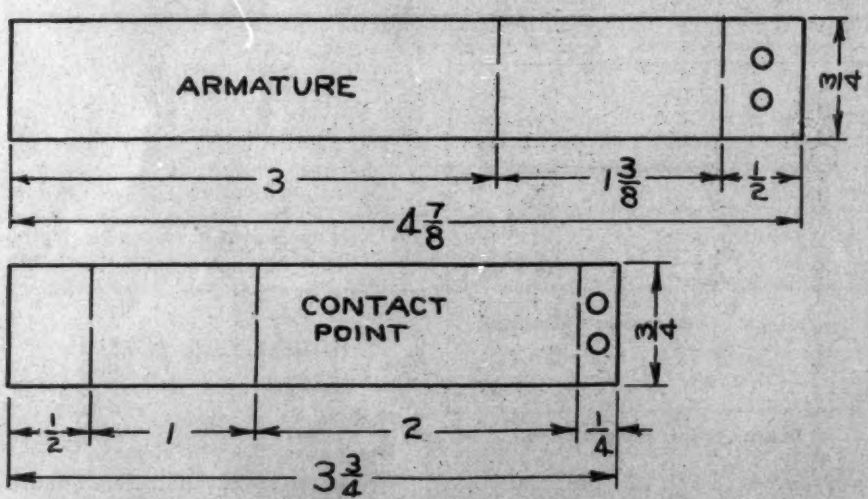

Fig. 5. Details of armature and contact point

BILL OF MATERIALS

Name	*No. Required*	*Material*	*Size*
Armature	1	Bright tin	¾ x 4⅞ in.
Contact point	1	Bright tin	¾ x 3¾ in.
Base	1	Wood	¾ x 3 x 5 in.
Electromagnet coil		Bell wire	12 ft. No. 18
Magnet core	2	Machine screws	No. 12-24 by 2 in.
Terminals	2	Machine screws	No. 8-32 by 1¼ in.
	4	roundhead screws	No. 3 by ½ in.

The *electromagnet*. The core is made of two machine screws 2 in. long. The holes for these screws are counterbored so that the nuts will fit flush with the bottom. The coils are wound according to the *clock rule*. Six feet of No. 18 bell wire on each core. See Figures 4 and 6.

The *terminals* are for connecting the buzzer to a switch and battery. Be sure to check your project with the wiring diagram before you hook it up to a battery. Remember that a No. 6 dry cell has 1½ volts but has 30 amperes. If you short the battery it will not last too long. When the wires become hot, you know that you are shorting the battery.

COURSE OF STUDY — FIRST YEAR VOCATIONAL MACHINE SHOP

ROBERT L. MOHLE

Hyattsville, Md.

I. Tool Use and Conditioning
  A. Use of hand tools
  B. Sharpening tools
  Jobs
  1. Sharpen drills
  2. Sharpen center punch
  3. Sharpen chisel
  4. Sharpen scriber

II. Benchwork
  A. Layout (scale, combination square, surface plate, etc.)
  B. Hack sawing
  C. Chisel
  D. Filing

E. Threading
F. Assembly work
Jobs
1. Drill drift
2. Parallels
3. Machine clamp
4. C clamp
5. Open-end wrench
6. V block clamps

III. Lathe Work
A. Construction and use of lathe.
8. Lathe centers

IV. Drill Press
A. Construction and use of drill press
B. Molding devices
C. Drills and their use
D. Reamers and their use
E. Counterbores, countersinks, and their uses
D. Irregular work
E. Keyways
Jobs
1. Cross peen hammer
2. V block
3. Keyway in gear
4. Wedge
5. Hand vise
6. Machine clamp
7. Welding plates

VII. Milling Machine Work

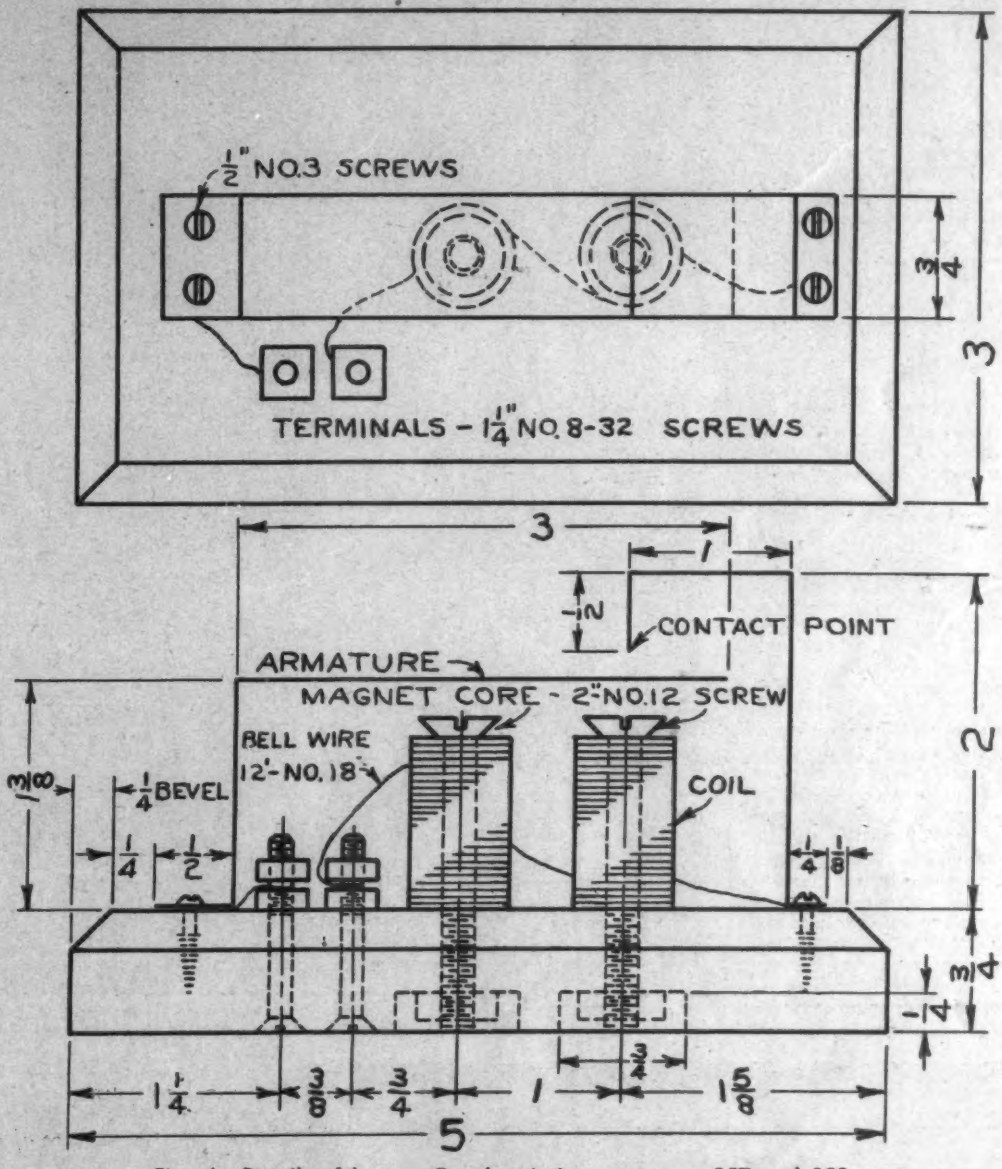

Fig. 4. Details of buzzer. For description see pages 257 and 258

B. Grinding tool bits
C. Centering
D. Spindle, straight, and taper turning
E. Knurling
F. Chuck work, drilling, reaming, boring
G. Threading
H. Faceplate work
Jobs
1. Grind set of tool bits
2. Adjustment screws
3. Lathe mandrels
4. Gear blank
5. Plug gauge
6. Ring gauge
7. Arbor collars

Jobs
1. Drill drift
2. Parallels
3. Machine clamp
4. C clamp
5. Open-end wrench
6. V block clamps

V. Heat Treatment
A. Annealing
B. Hardening
C. Tempering
D. Case hardening
Jobs
1. Center punch
2. Scriber
3. Cold chisel
4. Open-end wrench
5. Adjustment screws
6. Drill bushings

VI. Shaper Work
A. Construction and use of shaper
B. Straight shaping
C. Angle shaping

A. Construction and use of milling machine
B. Plain milling
C. Straddle milling
D. Indexed milling
E. Slotting and sawing
Jobs
1. Parallels
2. Toolmaker's clamp
3. Bolt heads
4. Keyway in shaft
5. Gear
6. Dovetails
7. Reamer

VIII. Grinder Work
A. Construction and use of grinding machine
B. Straight grinding
C. Taper grinding

D. Internal grinding
E. Cutter and tool grinding
Jobs
1. Lathe mandrels
2. Arbor collars
3. Gauges
4. Milling cutters
5. Reamers and taps

IX. Related Mathematics
A. Fractions
B. Decimals
C. Measurement
D. Algebra
E. Formulas
F. Geometry
G. Solving the right triangle

X. Related Drawing
A. Sketching
B. Making working drawings from sketches
C. Making working drawings from descriptions
D. Making working drawings from a broken part
E. Tracing
F. Designing

XI. Blueprint Reading
A. Conventional practice
B. Abbreviations
C. Three-view drawings
D. Two-view drawings
E. One-view drawings
F. Sectional drawings
G. Fastenings
H. Detail and assembly drawings
I. Cams and gears

AXONOMETRIC DRAWING

PAUL F. BOEHM

Greenwich, Conn.

Just as the pupils in grammar school learn to write, and to read written or printed matter, so the students taking courses in mechanical drawing are taught to make drawings of mechanical objects and to read them. The child is instructed to write clearly and legibly so the written word may be read easily and without error, and the thought expressed in writing may be comprehended by, and conveyed to the reader. Therefore the system of symbols or characters to be used in the art of writing is completely standardized and accepted among the millions using the same alphabet.

In the field of mechanical drawing the standardized system of describing, on paper, visualized or calculated shapes and dimensions of objects is that which, within the orthographic system, is known as the *multi-planar* or *orthogonal* system, mostly called *three-view* representation.

Fig. 1. Isometric and dimetric cube

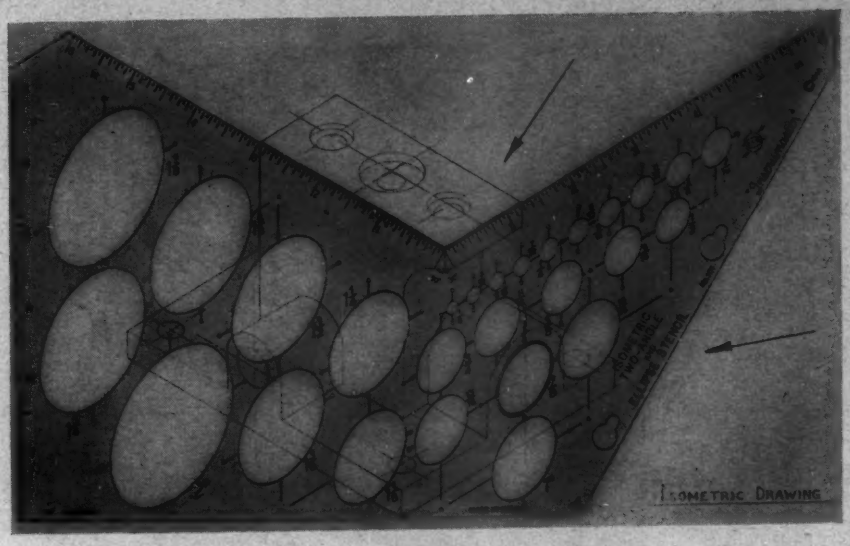

Fig. 2. Isometric two-angle and ellipse stencil

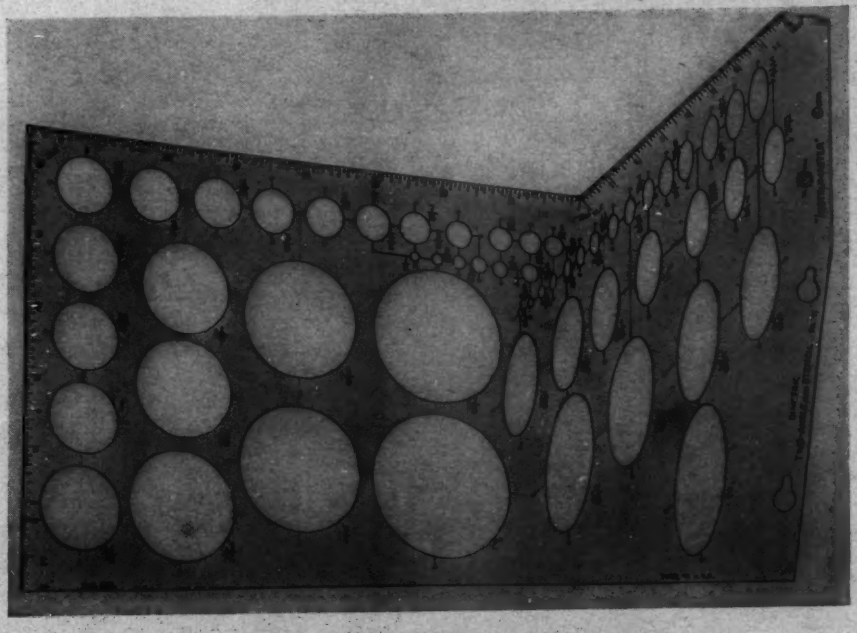

Fig. 3. Dimetric two-angle and ellipse stencil

Experience in industry and schools has shown, however, that this *front view, end view, plan view* system is definitely not the final answer to the problem. While it is comparatively simple for the person who makes the drawing, it is often extremely difficult for the beholder to comprehend what the drawing is intended to convey.

In fact, there is now an ever increasing trend to swing back to the older and more natural way of making a *picture* which shows the part or assembly not by two or three views (each showing only one side or face), but by one single, properly selected view.

Since no photo can be made of an object that, at best, exists only in the mind of the draftsman, the nearest approach would be to make a true perspective drawing to adequately

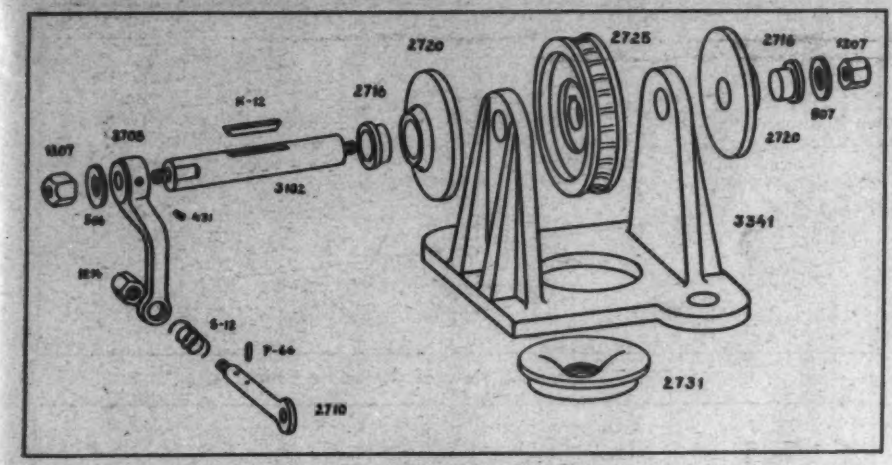

Fig. 4. Exploded assembly drawing

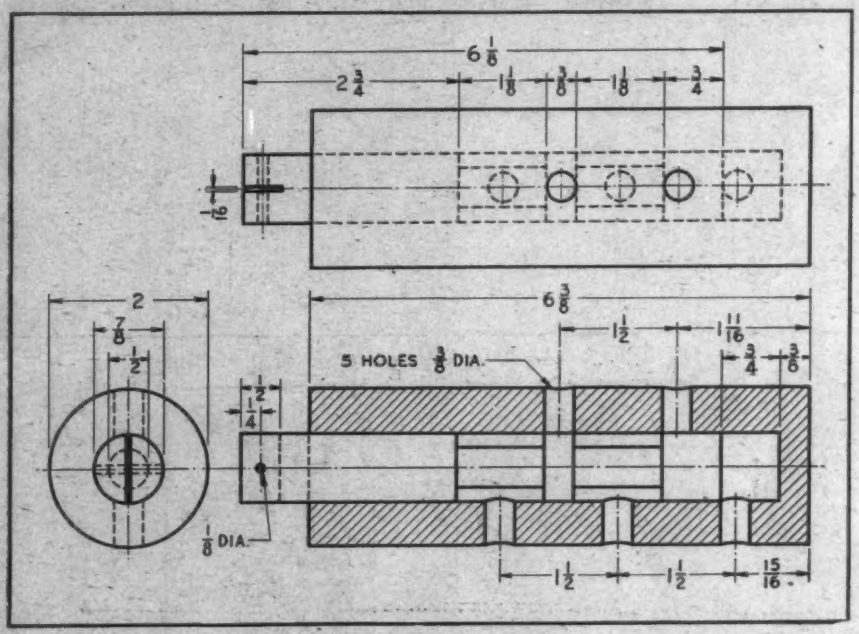

Fig. 5. A three-view drawing

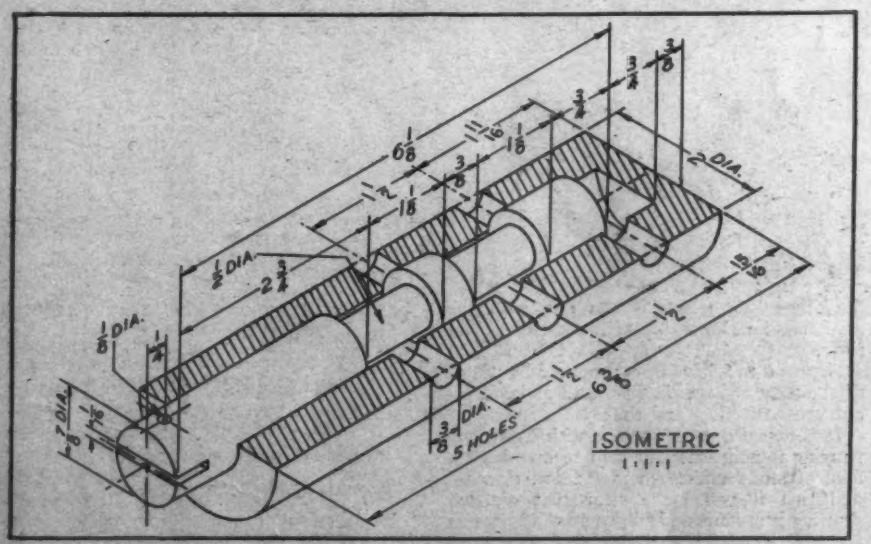

Fig. 6. An isometric drawing of the article shown in Figure 5

describe a given part or assembly. However, perspective is unsuited for mechanical drawing, because measurements cannot be readily taken and because making a perspective drawing is too cumbersome an undertaking for everyday drafting room practice.

Therefore, axonometric drawing is, for many reasons, the now accepted system for pictorial illustration of mechanical parts or assemblies. Such drawings can be readily made by any person having average skill, and they furnish comprehensible one-view illustrations on which measurements can be taken just as can be done on an ordinary working drawing or blueprint.

While axonometric drawing is subdivided into isometric, dimetric and trimetric, most courses in mechanical drawing are confined, in the field of pictorial illustration, to isometric; and only a few schools, colleges, and universities go as far as to teach also dimetric and trimetric drawing.

Most naturally, isometric drawing has been the favored selection because it calls for the use of one and the same scale in the direction of any one of the three axes, and the axes as well as all important lines parallel with them are at 90 deg. and 30 deg. to the horizontal. The isometric drawing, except for the representation of circles and circular arcs by corresponding ellipses and elliptic arcs, can be executed by means of standard equipment with comparative ease.

This is by no means true for dimetric and trimetric, where odd angles have to be used for laying out axes and lines parallel therewith, and various scales have to be used.

To familiarize the students with at least isometric and dimetric projection, the teaching aids shown in Figure 1 are extremely helpful. They consist of two transparent models of a cube, with center lines and circles of chosen diameters marked on three of the faces, each cube fastened to a back panel by transparent strips perpendicular to the panel and of such a width that their edges represent the projectors from every corner of the cube. In one model the cube is turned and tilted so that its projection is an isometric one, while in the other model the position provides for a dimetric projection.

Each panel is provided with a correctly outlined axonometric representation of the particular cube, including center lines and circles. Each model with its respective panel constitutes a unit that is held in cleats on a common main panel so that either one may be removed for individual demonstration.

With the aid of models of this type all the specific relations and conditions of isometric and dimetric projection, and the differences between them can be explained very clearly.

In order to simplify the task of making isometric and dimetric drawings, a new type of special instruments has now been made available. As shown in Figures 2 and 3, these aids are stencils or templates made of clear plastic sheet stock, each with three edges extending in the direction of the isometric or dimetric axes, respectively. Placing the base edge against the T square automatically positions the edges correctly in the direction of the axes. This is particularly useful in the case of the dimetric stencil, Figure 3, as otherwise the correct angles of 7.2 deg. and 41.4 deg. for the two slanted axes and lines parallel therewith would have to be laid out by means of a protractor. This is tedious and invites mistakes.

Three edges of the stencils are provided with inch graduations which are full scale in

the isometric stencil shown in Figure 2; while only two of them are full scale, and one is half scale, in the dimetric stencil shown in Figure 3. The use of these graduations not only saves time but again prevents applying the half scale, in dimetric, to a wrong axis or dimension line.

While the *two-angle* feature and the various graduations embodied in one integral instrument already constitute a highly welcome development in the line of drafting equipment, the fact that both stencils contain a great number of elliptic openings, ranging from ⅛ in. up to 2 in. (axonometrically), and of correct isometric or dimetric axis proportions, makes these new instruments ideal for producing axonometric drawings.

The ellipses are correctly positioned so that their co-ordinated, axonometric diameters (dimensioning diameters) are automatically parallel with the corresponding isometric or dimetric axes no matter in which position the stencils are applied to a particular problem.

At the right-hand side, the stencils are cut at such an angle that if this slanted edge is placed against the T square the position of the elliptic openings (the slim ones in the dimetric stencil) is correct for illustrating circles in the horizontal top or bottom surfaces of the object.

Screw threads are drawn speedily by repeatedly using one appropriate opening for making elliptic arcs in intervals corresponding to the pitch of the thread.

Numerous tests have proved that students and draftsmen readily learn to use these stencils and turn out perfect axonometric drawings in considerably less time than it took them with the equipment previously available; or in making the ordinary working drawings of the two-view or three-view type.

What seems to be the greatest gain achieved by the introduction of the stencils described is the possibility for the student to go into the field of axonometrics without hesitation as there are no intricacies of odd angles and scales in his way, not to mention the fact that the bothersome construction of ellipses point by point or by the approximate four-center method is removed from his path. Exploded assembly drawings, like the one shown in Figure 4, which have proved their value in certain industries, may be now included in the program of courses in mechanical drawing.

The facility with which the *two-angles* and *ellipse stencils* may be used, puts the user in the position to choose freely the most suitable axonometric system (isometric or dimetric) for representing a particular part or assembly, and within the chosen system to elect the most advantageous position of the object. To illustrate this, Figures 5 to 9 are drawings of a two part valve assembly, made by different methods of mechanical drawing.

Figure 5 is a drawing of the *three-view* type. The characteristic shapes of the parts and certain details are not easily recognized by the uninitiated. Figure 6 shows the same assembly in isometric representation, the outer part half sectioned. The assembly is shown as seen from front and right. The opposite position, seen from front and left would be no different, except being the mirror picture of the view shown.

Figures 7 to 9 are intended to demonstrate the great flexibility of dimetric where different positions may be chosen in order to bring those faces of the object that require the greatest number of details or dimensions into the front side which is the one with the minimum foreshortening of horizontal dimensions.

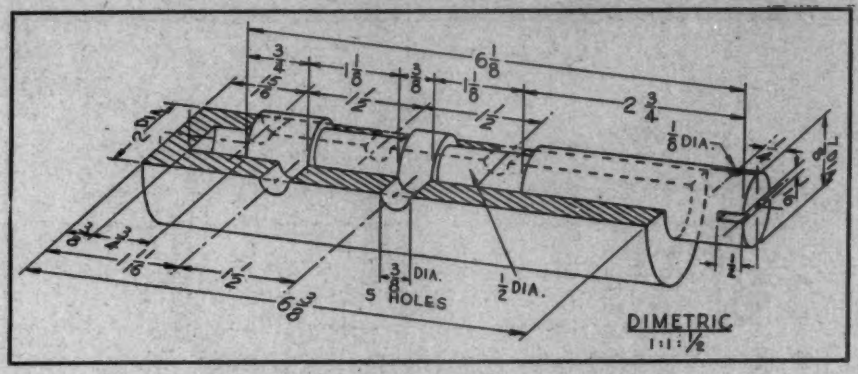

Fig. 7. Dimetric view of the same article

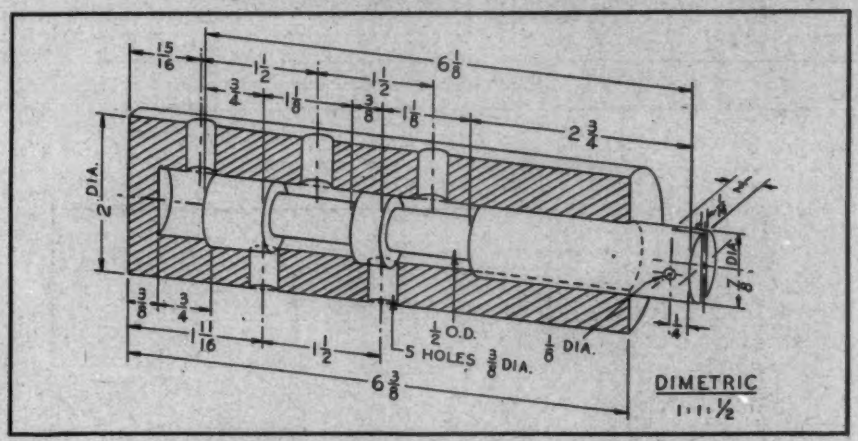

Fig. 8. Another dimetric presentation of the article

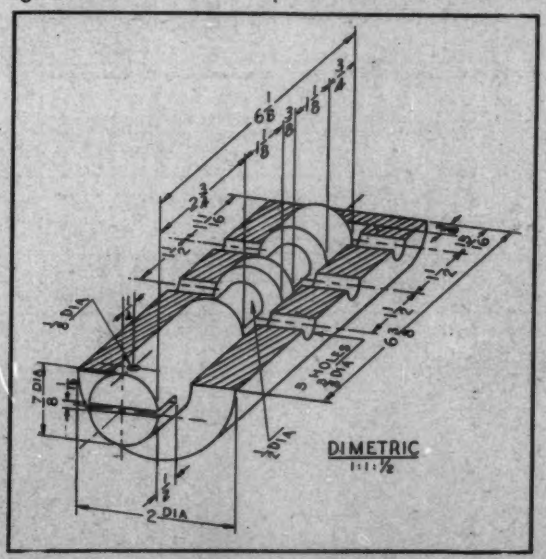

Fig. 9. Still another dimetric view

Figures 6 to 9 have been produced by means of the stencil shown in Figures 2 and 3 without waste of effort and time.

It is hoped that this article with its accompanying illustrations will help to broaden the field of study offered in mechanical drawing, and that it will make clear that dimetric drawing is a valuable addition to the isometric method. Knowing how to produce these dimetric drawings with speed and accuracy will help the future draftsman receive a higher rating in his chosen profession.

MAGNETIC SWEEPER

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Since safety is one of our cardinal principles of education, I have tried to make this aim second nature to my pupils. Recently a

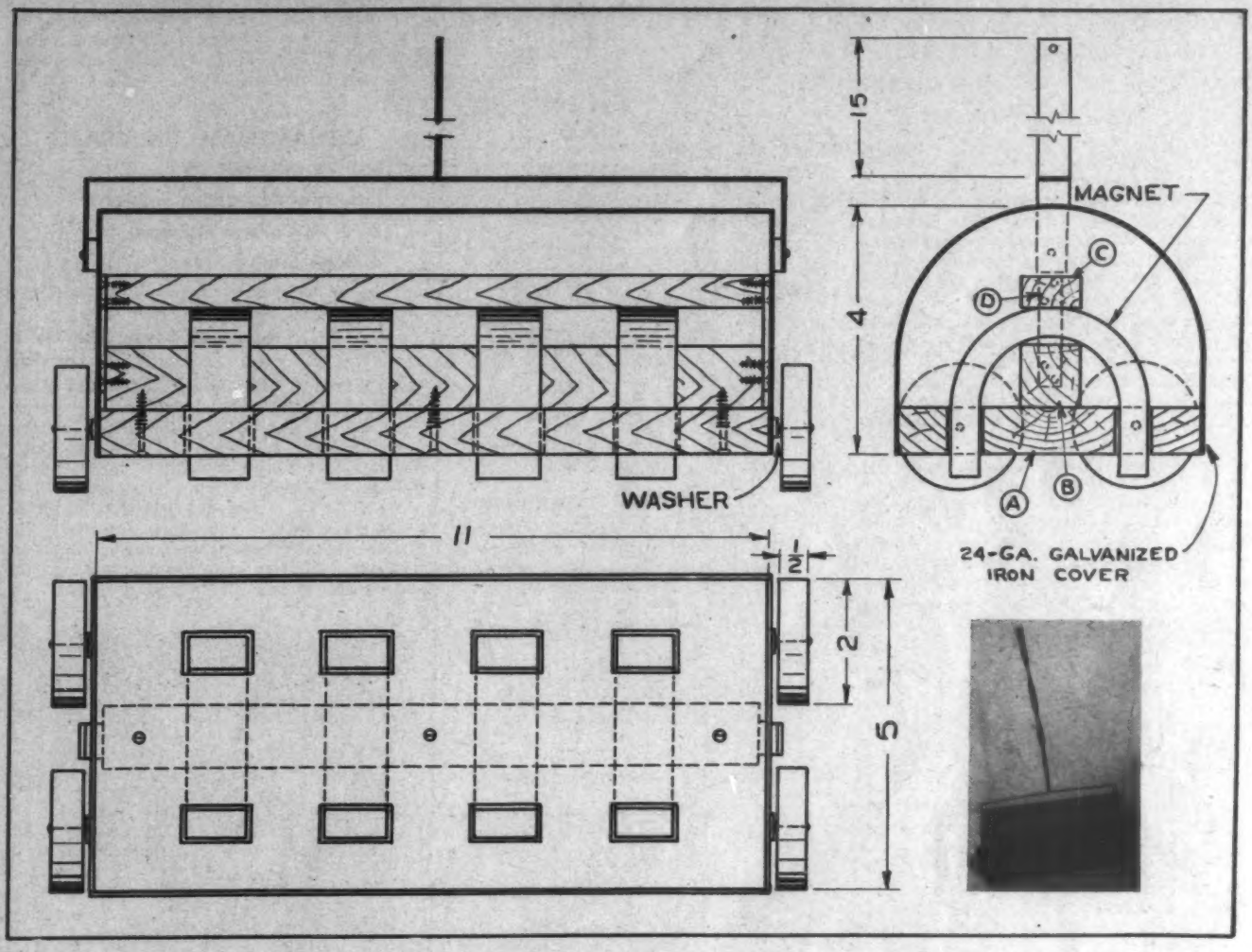


Fig. 1. Details of the magnetic sweeper

novel idea came to my mind that has helped to emphasize the idea of safety.

The little magnetic sweeper shown in Figure 1 will pick up the smallest piece of iron or steel. By just rolling it along, whatever bright tin or iron that has been left on a bench will be carried along by the magnets mounted inside the sweeper. This material is then brushed off into a waste can.

The magnets are fastened in place as follows:

1. Screw to base *A* a piece of wood *B*, which fits under the magnets. Piece *B* is almost as long as the base. See Figure 1.
2. Drop the magnets into the holes that have been cut into the base.
3. Place another piece of wood *C* on top of the magnets.
4. Screw piece *D* to *B* and *C*.
5. Screw another piece, similar to *D* on the other end to *B* and *C*. This will hold the magnets firmly in place.

Magnets may be obtained from:

Central Scientific Co., 1700 Irving Park Blvd., Chicago, Ill., Catalog H 351, p. 582 — Laboratory Apparatus and Supplies.

Chicago Apparatus Co., 1735-43 N. Ashland Ave., Chicago, Ill., Catalog No. 48, p. 145 — Science Laboratory Equipment.

National Scientific Co., 2204 W. North Ave., Chicago, Ill.

HOW TO CONSTRUCT AN ALTAZIMUTH

A. G. BELESON

High School of Science

The Bronx, New York City

The purpose of this instrument is to locate celestial bodies by means of two quantities, altitude and azimuth. Altitude is the angle from the horizon to the celestial object. It is measured in degrees. Azimuth is the angle from south to west to north to east and back to south. This angle is measured around the horizon in degrees.

To use the altazimuth it must be oriented. The point on the circular protractor marked *North 180°* must be pointed north. Then rotate the quadrant so that the celestial body can be seen in the sight of the altazimuth, and read the azimuth from the circular protractor. The angle is indicated by the pointer. The altitude is then found by observing where the plumb line crosses the scale on the quadrant.

Thus, a table of observation might read:

Star	*Time*	*Altitude*	*Azimuth*	*Date*
Sirius	20.00	37°	343°	12/12/44

This instrument may also be used in reverse by taking the altitude and the azimuth and the time and date from the nautical or air almanacs, pointing the instrument in the directions indicated, and upon sighting through the sight, the celestial body can be seen.

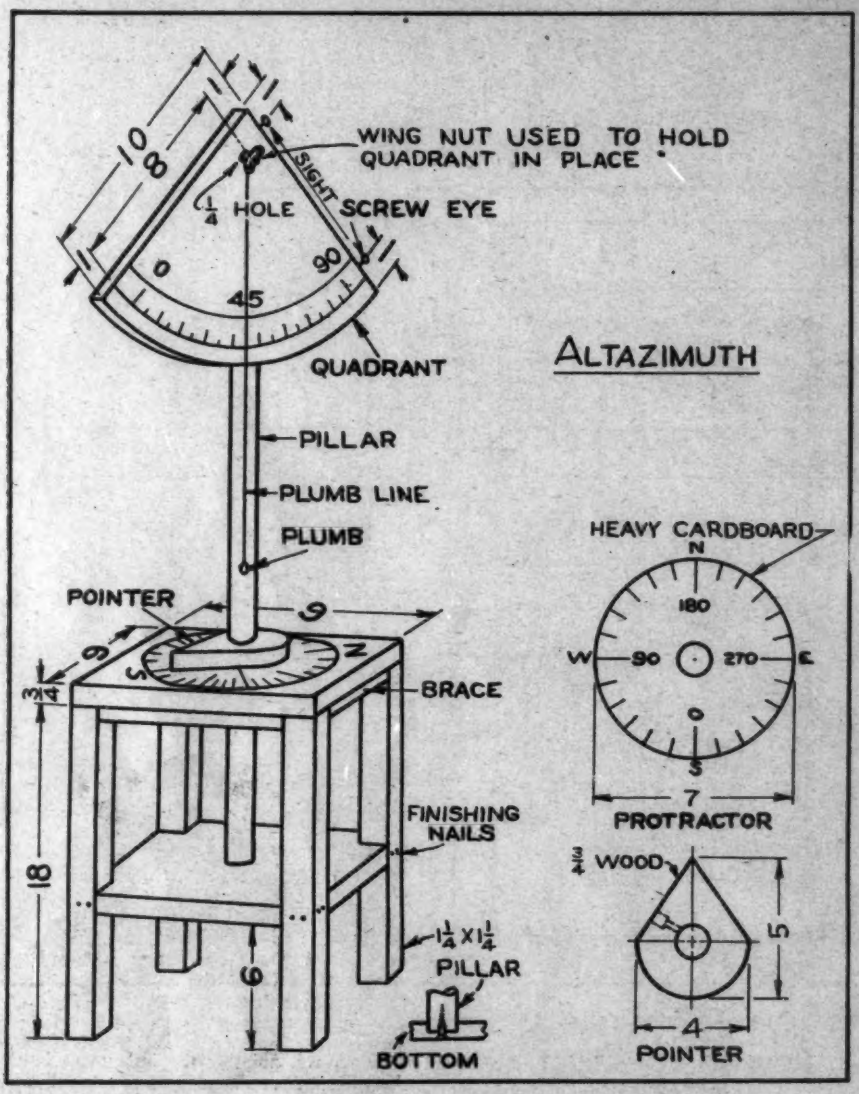
Details of Construction

The Quadrant: The quadrant is made of ¼-in. plywood. Other materials may be used such as Prest-wood, galvanized iron, or even heavy cardboard. If Prest-wood or plywood or heavy cardboard is used, then the screw eyes used for the *sight* can easily be screwed in place. On a metal quadrant, the screw eyes must be soldered in place. The numbers indicating the degrees are stamped into the quadrant. Use steel stamping numbers. Be sure to place the quadrant on a solid surface so that the numbers will come out clear. Try a sample on some scrap wood so that you will know how hard to strike the steel number dies. On a cardboard quadrant the numbers may be inked with a pen.

The Pillar: Use a broom or mop handle. The length should be 4 ft. If the altazimuth is found to be too high for the user, then he may cut the pillar to suit his height.

The Plumb Line: A piece of fishing line is best. However, ordinary wrapping string will serve the purpose.

The Plumb: A lead sinker used for fishing will serve for a plumb. A steel ball of about ¾-in. diameter with a hole in the center for the string will also serve the purpose.



Details of the altazimuth

BILL OF MATERIAL

Part	No. of pcs.	Material	Size
Quadrant	1	Plywood	¼ x 10 x 10 in.
Sight	2	Screw eyes	No. 114½
Pillar	1	Dowel	1 x 54 in.
Pointer	1	Pine	¾ x 4 x 5 in.
Protractor	1	Heavy cardboard	7-in. diameter
Stand			
Legs	4	Pine	1¼ x 1¼ x 18 in.
Top	1	Plywood	¾ x 9 x 9 in.
Bottom	1	Plywood	¾ x 9 x 9 in.
Plumb	1	Lead sinker	
Plumb line	1	Fishing line	30 in.
Machine screw and wing nut	1		¼ x 2½ in. long
Finishing nails	16		6d
Carpet tacks	4		

The Protractor: The protractor is made of heavy cardboard. All degrees should be carefully checked. It is so made that 0 is south, 90 is west, 180 is north, 270 is east, and 360 is south.

The Pointer: The pointer is made of wood at least ¾ in. thick. A hole is drilled and then counterbored to allow the head of the screw into the pointer. The screw should be 1¼ in. long so that it will enter the pillar and hold the pointer secure. There should be a space of 1/16 in. between the pointer and the protractor so that the pointer will not scratch the protractor. The hole in the protractor and the top and bottom of the stand should be bored to fit the diameter of the pillar.

The Stand: The top and bottom of the stand can be made of plywood ¾ in. thick. If plain wood is used, the wood should be braced to prevent warping. The legs are nailed in place. Use 6*d*. finishing nails. Screws may be used if available.

ORNAMENTAL TIN CRAFT

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(Continued from page 220 of the May, 1946, issue)

Notebook Cover With Metal Overlay

Craftsmen and students always seek newer and more attractive methods of decorating covers of notebooks, photograph albums, recipe notes, and numerous keepsake collections. This article describes a novelty notebook or scrapbook built from pressed Nu-wood which carries an attractive design of the material. This is further accentuated by the addition of copperplated double thickness sheet tin letters and ornament to give the notebook a distinctive touch.

Fig. 1. Notebook cover

BILL OF MATERIALS

No. of pieces	Item	Size
Will depend upon design selected	Sheet tin	
2	Three plywood	9 x 11½
3	Binding posts	
2	Hinges	
	Copper brads	
	Solder, flux, steel wool	

This is a very flexible project because the size of the covers can be changed to suit the requirements of the craftsman, and he will also wish to use different lettering, symbols, or emblems to decorate the cover. The one shown is a typical and popular arrangement for students and novices who happen to live in the state of Texas.

The letters and ornaments should be cut with a jeweler's saw and fastened in place with short escutcheon pins or copper round-head brads. The nails should be trimmed from the back side and dressed smooth with a flat mill file. The hinges may be either metal or

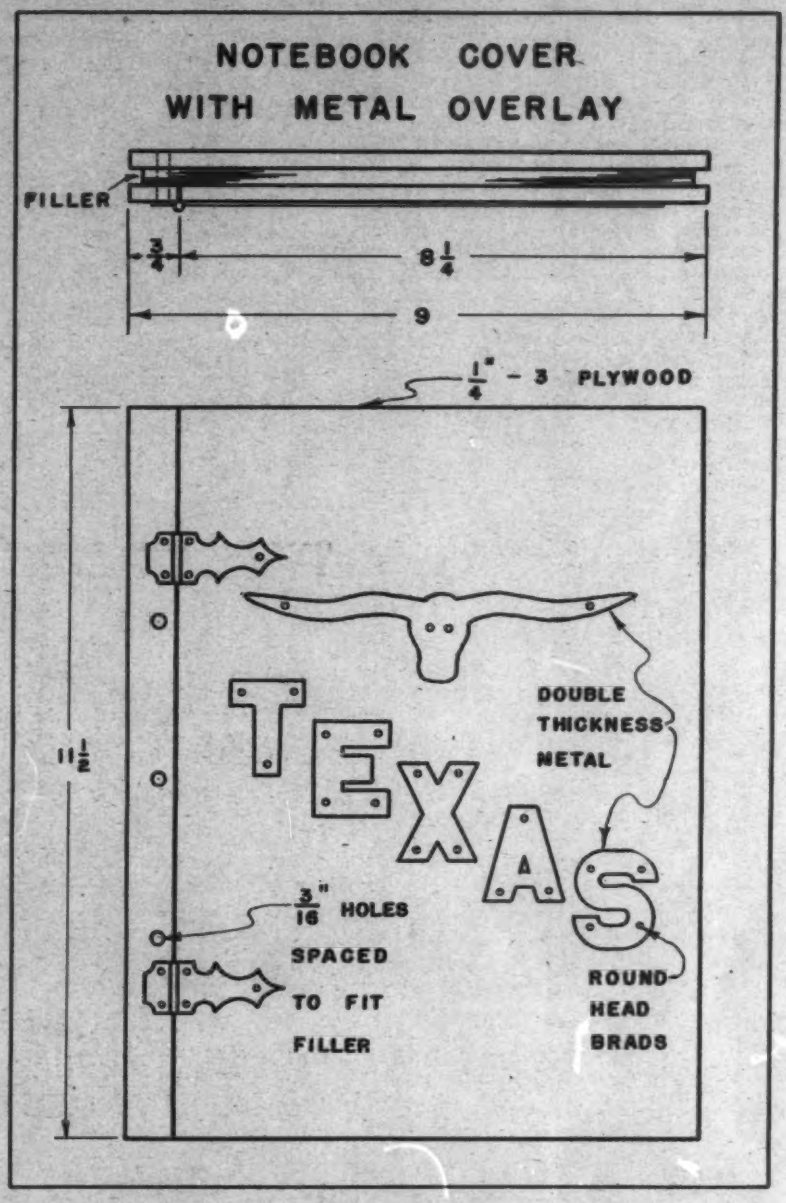

Fig. 2. Details of bookcover

leather thongs. The covers hold the filler in place with leather thongs or binding posts. These many ideas depend upon the pattern and design which the designer wishes to employ. The sizes shown in the illustration are for 8½ by 11-in. notebook paper or typing paper.

Tools: Asbestos sheet, brush, carbon paper, copperplating setup, emery cloth, files, flat iron, hammer, hand drill and bit, heating device, jeweler's saw frame and blade, lead weight, pencil, rule, scriber, soldering copper, tempera water color paint — yellow, tin snips, and necessary tools for making wood parts.

Procedure

1. Make necessary wood parts for book.
2. Select appropriate design and letters.
3. Cut out 2 pieces of tin stock large enough to make desired ornaments.
4. Solder one side of each piece.
5. Sweat both pieces together with hot flat iron. Weight the soldered parts together immediately as more is sweated.
6. Apply coat of yellow tempera water paint to one side of sweated piece for design transfer.
7. Lay design sheet and carbon paper over painted portion and trace design.
8. Drill necessary holes for piercing, and fastening to cover.
9. Cut out letters and ornaments with tin snips and jeweler's saw.
10. File and dress edges with emery cloth.
11. Clean and copperplate ornaments and letters.
12. Clean and apply clear lacquer to letters and ornaments.
13. Fasten ornaments and letters to cover with brads.
14. Trim and file points of brads extending through cover stock.

INTRAMURAL ADVERTISING AND THE PRINTING INSTRUCTOR

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Newburgh Free Academy

Newburgh, N. Y.

Every printing instructor is usually loaded down with requests for posters or the like to advertise some school activity. There always seems to be a dance, football game, or exhibition and when the country was at war, there always were some schemes to promote the various war efforts. He seldom can refuse. He seldom does refuse but the type of work he can produce is usually limited. Either his press is too small or his type sizes and styles are limited, or desirable cuts are not available. With the still existing limitations on paper, and the advancing costs, he has still another headache.

This article will show how posters can be produced without any fuss, limitations, or extra hard work. As the method of producing such advertising deals with silk-screen printing, the instructor is limited only by the size of the silk screen he may have or care to make. Of course, he must be familiar with the process of silk-screen printing. If not, he can become familiar with it at a small cost. Once familiar with this type of printing he can produce the work with the same result as shown in the illustration.

Silk-screen printing on the blackboard

This illustration shows a three-color job produced on the blackboards of Newburgh's three secondary schools. It is entirely the work of pupils, two boys and girls. The eagle was produced in blue, the background of "United War Efforts" in red and the balance in white. The results are exceptionally clear. It is needless to mention the enthusiasm such work creates in the pupil in the print shop and also those pupils who read such advertising. These posters were left on the blackboards for ten days and when no longer of use were removed by the janitors on their regular board cleaning day. A sponge and water did the job the same as with chalk. The only effect on the blackboard was a cleaner spot where the poster had been. The reason for this will be readily understood as the reader proceeds.

Now let us proceed with the production of such a job.

Preparing the Screen

The screen is prepared exactly the same as for any silk-screen job. There is nothing different to be done in cutting the film, adhering, masking, or filling. The only thing is to be especially careful that there are no leaks.

Preparing the Paint

As stated before, the blackboards were washed with sponge and water. Therefore no regular silk-screen paint can be used. Tempera or show card colors take its place. The medium substitute for transparent base is soap in granular form, Ivory Snow being preferred. These granules must be mixed with water, a very small amount being added at a time until the soap has reached the consistency of thick mush. Be careful not to have this too dry. Next open the can of show card paint of the desired color and stir until *thoroughly* mixed. This is very important because it affects the density of the print. Experience will determine the amount of paint to be mixed. Better to have too much than too little as it can be saved and used again. In a separate clean container, using a tablespoon, mix the soap and paint to these proportions: One part soap to three of paint. Mix this thoroughly. It should, when completed, be of the same consistency as silk-screen process colors when ready for use. If too thick add water — a *very little* at a time. If too thin add soap granules — a very little at a time. After doing this type of work a few times the paint mixing will become easy.

Printing the Poster

Because the screen will be held in a vertical position against the blackboard, the instructor may be concerned about paint running out of the screen on to the floor. This has never happened in all the work we have produced by this method but it might be a good idea for the novice to fasten a tin or heavy pressboard trough to the bottom of the screen.

From now on it will be more convenient and faster to have three pupils working — one to hold the screen, the second to run the squeegee and the third to take care of the ink supply.

Make sure the squeegee is sharp.

Have the pupil place the screen against the blackboard in the desired place and position, and hold it firmly. The second pupil then places the squeegee in position at the bottom of the screen and the third pupil covers the entire length of the blade of the squeegee with a generous supply of paint. The squeegee is then run to the top of the screen exactly as though printing on paper or poster board. Care should be taken when removing the squeegee from the screen to get all the excess paint on the blade. This can then be emptied into the container held by the third pupil. The screen is then removed from the board lifting the right edge toward the left as though it were hinged to the board. The job in this room is now completed. Once the knack is acquired, thirty rooms can be done in less than one hour.

Sometimes schoolrooms are quite warm. This may cause the paint to dry in the screen. Should this happen wash the screen and dry it thoroughly. While it is drying, add a little water to the paint. This will only take a few added minutes. Experience will soon show how to determine the consistency of the paint.

It is advisable to use only one color on the first job you attempt until you get the "feel" of it. When you wish to do two colors or more proceed exactly as stated here. The only difference being that the register marks cut in each film are not filled in before printing. They will print on the first color thus allowing you to determine where the other colors go. A small cloth used by the third pupil can easily remove these marks when the last color has been completed.

This type of printing is so simple and so astounding in its results that all printing instructors should give it a trial. From an economical standpoint it cannot be beaten. There is no waste paint, no paper to be thrown away, and the screen can be used over and over again.

Because of the black background, only bright colors, such as yellow, white, bright blue, bright green, or bright red should be used.

If these posters are to be placed in windows, stores, etc., they can be printed on black or dark colored poster board with the same paint used on the blackboard.

MODEL BOAT MOTORS AND FIXTURES

CLAUDE W. HORST

West De Pere, Wis.

There are three different kinds of motors commonly used by powerboat fans. Spring, steam, and gas motors each have their own place in the field, and advantage and disadvantage.

Spring Motors

Spring motors are the most dependable plants, and are probably the most suitable variety for a small boat. They should be oiled frequently and kept as dry as possible, although an occasional drenching does most of them no harm. They run from five to seven minutes on a winding and speeds of one and a half to possibly three miles an hour can be obtained. Small motors such as that shown in Figure 1 are suitable for boats up to 20 in. in length. The one shown is sturdy and costs about $1.25. It is very easily installed since the propeller shaft tube is attached to the motor. Boats from 24 to 36 in. require a larger size motor, such as is shown in Figure 2. Complete with propeller and shaft, this type costs about $2.

Steam Power Plants

The simplest form of steam plant, such as that shown in Figure 3, consists merely of engine, boiler, and an open burner. The boiler is a metal cylinder mounted on a frame, to which the engine is attached. The burner is a small pan for alcohol or sterno, and is pushed under the boiler. No safety valve is needed since a spring holds the motor against the oscillating plate, and excessive steam pressure forces the motor from the plate and permits its escape. A water guage is not needed since the burner fluid will be consumed before the boiler runs dry. Frequent oiling of the moving parts with some good lubricating oil is the chief care needed. The installation is an easy

Fig. 1. Small-size spring motor

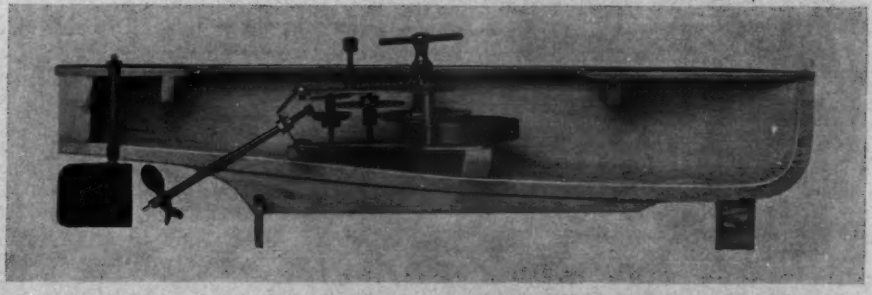


Fig. 2. Large-size spring motor

Fig. 3. Oscillating steam plant

matter, since engine and boiler are one unit. This type will move small models from 16 to 30 in. in length, from a half to two and a half miles an hour. These engines cost about $2.

The most popular steam plant is of the double acting D-slide-valve variety, resembling the large marine engines. They come in a number of sizes, the smallest of which are suitable for models as small as 30 in. in length. The cost varies greatly, but some may be obtained as cheaply as $10. They are not racing engines, but they will send a model through the water at a 10- to 12-mile clip under proper conditions. The burner is usually of the gasoline blowtorch type, filled to about two thirds to figure out quite accurately the power of its capacity with gasoline and then 10 to 15 lb. of air pressure put in with a tire pump, and started in the usual plumber's blowtorch fashion. They will run about a half hour on one filling. The water is heated very quickly as the firebox extends entirely through the boiler and there are also tubes through it for increased heating surface. There is a dome at the top of the boiler from which the accumulated steam is directed back through the firebox and superheated before it reaches the engine. The plant shown in Figure 4 generates steam at 75 lb. pressure in about three minutes. There are gauges for water and steam, and a combined filler plug and safety valve.

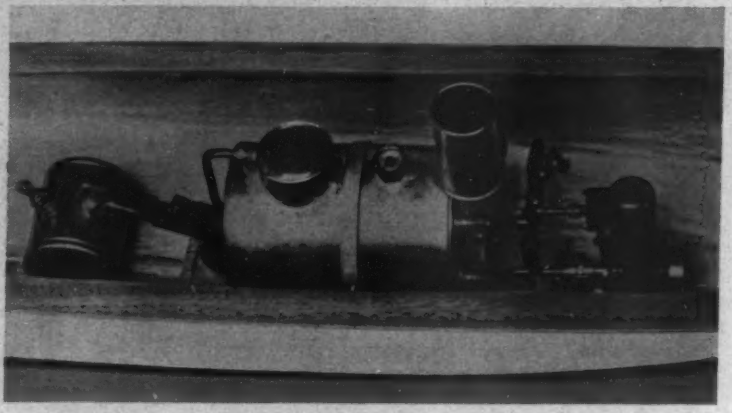


Fig. 4. Steam engine plant

Fig. 5. Forty-inch model in action, powered with a steam plant

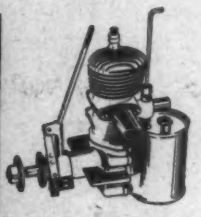


Fig. 6. Gasoline engine

The installation of this sort of plant must be done very carefully as the individual units must be lined up perfectly in relation to each other. There are also certain precautions to be taken in the operation of such plants.

1. The moving parts of the engine must be kept well oiled.
2. The safety valve must be checked frequently to make sure that it does not corrode and stick.
3. The cylinder lubricator must be checked frequently, drained of water, and refilled with steam cylinder oil.
4. The water level in the boiler must always be near the top of the gauge before the torch is lighted.
5. Joints in the steam line should be checked frequently and kept tight as vibrations loosen them.
6. The propeller shaft and engine assembly must be checked from time to time and kept in alignment.
7. Setscrews in the shaft couplings and propeller must be checked frequently and kept tight.
8. Bolts fastening down the engine must be checked occasionally as they sometimes work loose.
9. The propeller shaft packing gland must be checked for leakage.
10. Gasoline must be strained through a chamois skin to prevent foreign matter from plugging up the burner nozzle.
11. Gaskets in the steam line must be replaced whenever they become hard.
12. Whenever the boat strikes an obstruction or runs up onto the beach the propeller and the shaft must be examined carefully as they are likely to be bent, or the strut may be thrown out of line.

In general a model having a complicated power plant must be handled carefully.

For greater speed a trunk piston engine, shown in Figure 5, is sometimes used instead of the D-slide-valve variety. Structurally it is more like a gasoline motor than a marine steam engine and can be operated at a much higher r.p.m. Because of the trunk piston, it has only half the number of power strokes per revolution that the D-slide-valve engine has. It is most suitable for a very fast type of hull such as an express cruiser or the larger runabouts. It cannot, however, compete with a gasoline engine for racing, unless used with a flash boiler. The operating problems are similar to those already discussed for the D-slide-valve engine.

For racing, a flash boiler, a trunk piston engine, and a good hot blowtorch make a very efficient power plant. The flash boiler is similar in appearance to the one already described, but it differs in that all the water is carried in a coil, or coils, of steel or copper tubing arranged to provide the maximum heating surface, and usually enclosed in a cylindrical metal housing, asbestos covered to conserve the heat. The coils usually terminate in a steam dome in which 500 lbs. of steam or even more, is carried. It is a very rapid steamer, and the small quantity of water that is carried is pumped in from the outside by a small pump operated by the engine. The pump must be so adjusted that the water enters the boiler at the same rate that it is converted into steam and used by the engine. When operating perfectly this type of power plant will develop considerably more power per unit of weight than a gasoline motor. But that is somewhat difficult to achieve since the water supplied by the pump, the steam consumed by the engine, and the heat supplied by the burner must be well synchronized to get the maximum efficiency. The high steam pressure makes it difficult to keep the boiler tubing joints, as well as other connections in the steam line, tight. It really takes a good engineer to operate a flash steam plant efficiently.

Gasoline Motors

During the last few years there has been a marvelous improvement in small gasoline motors. Most of the numerous makes on the market are of the air-cooled variety similar to the one shown in Figure 6. These were designed for model airplanes. Other than racing hulls, model boats are most likely to be replicas of pleasure or commercial craft having some sort of cabin structure, making it nearly impossible to use air-cooled motors. Racing hulls usually have sides low enough and are run at speeds great enough to create sufficient breeze to allow air-cooled motors to function efficiently. An airplane motor is started with the propeller, consequently a single throw crank is very satisfactory for starting purposes. Some of the builders have tried to adapt their motors for marine use simply by putting a combination flywheel and propeller-shaft coupling on the propeller end of the motor. This works all right with an easy starting motor, but most gas engines are temperamental at times and a major requirement for any really satisfactory marine motor is a double throw crank with a flywheel at one end and the shaft coupling at the other, so the starting torque can be applied conveniently. Figure 7 shows a typical marine motor. There are several methods of starting. The simplest consists of wrapping several turns of strong cord around the flywheel and giving this cord a quick steady pull. More efficient are the small motorized mechanical starters which are mounted entirely separate from the boat. A practical one consists of a 6-volt battery, an ordinary auto starting motor to which is connected a flexible shaft attached to the gas motor in the boat by means of a temporary coupling which automatically disengages when the motor starts.

Gas motors are made in a number of different sizes from about ½-in. bore and stroke, to about 1¼-in. bore and stroke. For boats not to be used for racing great care should be used to select a motor that will propel the model at a speed proportional to that of its prototype. Most gas engines develop more power than is needed for most displacement models of the usual commercial and pleasure launches. Material on model naval architecture to be found in any good library will help one.

Gas motors can be obtained as cheap as $10, but most of them cost much more. Water-

cooled motors are naturally much more expensive than air-cooled ones because of the more complicated cooling facilities. An excellent single cylinder engine with a double throw crank may be obtained for about $30.

To insure the maximum efficiency there are several things to be kept in mind.

1. The shaft angle should be kept as low as possible. For this reason the motor should be installed as far forward as is practical. The auxiliary equipment of a model gas engine weighs more than the motor, and can be placed to properly trim, or balance, the boat.
2. Only the best grade of fuel and lubricating oil should be used.
3. Fuel should always be strained through a chamois skin to prevent water from getting into the gas tank, and to remove small foreign particles which would find their way to the needle valve of the motor and cause trouble.
4. Ignition batteries should be used sparingly as the electrical capacity of the batteries designed for models is small.
5. Care should be taken to keep the motor and its auxiliary equipment dry.

Problems of Installation

There are certain problems of installation that are common to all types of power plants. Securing the proper floating balance is the first step. The simplest method of doing this is to place the completed boat in a tub of water and then arrange the motor and its auxiliary equipment in the required positions. The motor itself is generally placed about midway. Mark on the outside of the hull the fore and aft position of the aft end of the drive shaft.

To determine at what angle and where to bore the hole through the hull for the propeller shaft, lay out the propeller shaft center line on the drawing from which the boat was built. To do this, indicate on the drawing the fore and aft position of the aft end of the drive shaft as marked on the hull of the model, allow ample clearance between the lowest part of the motor and the inside of the boat, and about ¼-in. clearance between the tips of the propeller blades and the outside bottom of the boat. See Figure 7. The center of the propeller shaft will be a straight line between the center

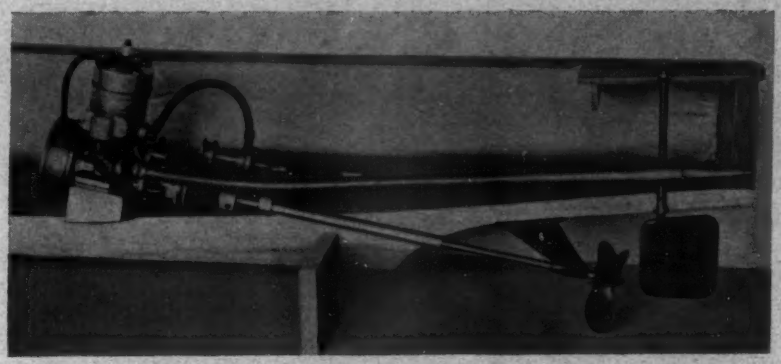


Fig. 7. Gasoline-motor plant

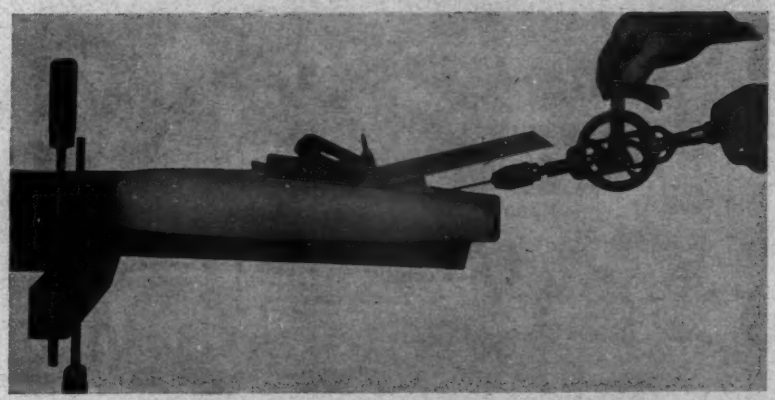


Fig. 8. Drilling shaft hole with the aid of a T bevel

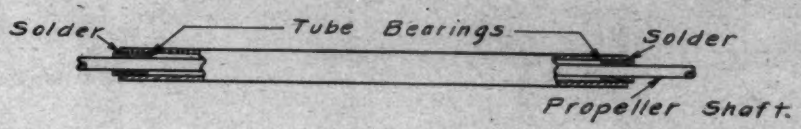


Fig. 10

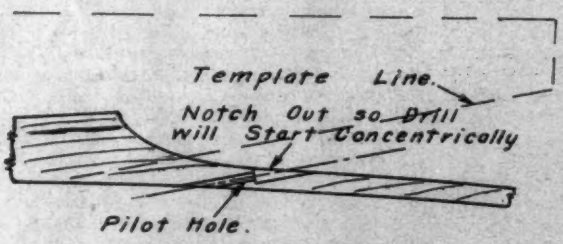


Fig. 9. Driling shaft-tube hole

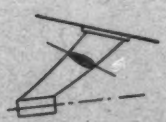


Fig. 11. Streamlined cast strut

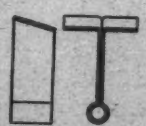


Fig. 13. A strut made of sheet metal

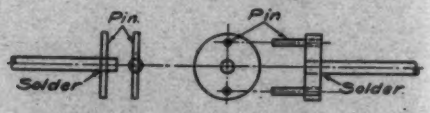


Fig. 14. Flexible coupling

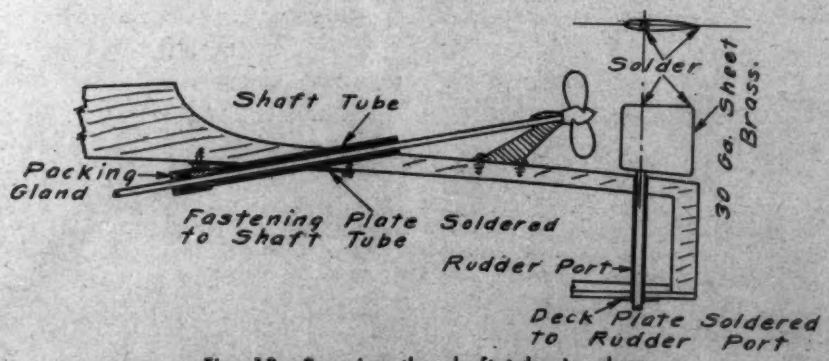


Fig. 12. Securing the shaft tube in place

of the propeller and the center of the drive shaft of the motor. Set a T bevel to the exact angle made by the shaft line and the bottom of the boat as shown in Figure 8, or make a template of this angle. On the hull, spot the fore and aft position of the shaft hole as indicated on the drawing, and bore a small pilot hole at the angle indicated by the T bevel or the template. Figure 9. Check the hole for straightness, and bore the hole the proper size for the shaft tube later. Greater accuracy in boring will result if a small notch is first cut into the bottom of the boat with a ⅛-in. chisel, as shown in Figure 9.

There are several general shaft assembly arrangements. In the smaller boats having spring motors or the smaller type of steam engines, the strut may be eliminated by extending the shaft tube from the motor to the propeller. Usually the bearings at the ends are made of ¼-in. lengths of tubing that are snug fitting but allow the shaft to turn freely. A drop of solder holds the bearing in the shaft tube, as shown in Figure 10. The shafts are usually of stainless steel or bronze 1/16 in. or 3/32 in. in diameter.

For larger models, more than 30 in. in length, it is advisable to use a strut to support the aft end of the propeller shaft rather than extending the shaft tube all the way to the propeller as this creates unnecessary water disturbance and resistance that very appreciably slows up the boat. In this case the shaft tube extends just through the hull. A marine packing gland is used instead of the bearing just described. The gland may be at either end of the tube, but having it at the motor end makes for a smoother underwater surface. To be really substantial, the strut should be cast of brass or gun metal from a very accurate pattern of wood, similar to the one shown in Figure 11. After the casting is made drill holes for the propeller shaft and the fastening bolts. A fair job of smoothing the surface may be done with a file and emery cloth. To attach the strut to the hull, turn the boat upside down on the bench, place the propeller shaft in the tube, and slide the strut down the tube until it comes in contact with the bottom of the boat. It must fit perfectly and be in perfect alignment with the shaft tube. Very small discrepancies may be removed by filing the casting. Figure 11 shows the completed job. The strut may also be made of heavy sheet brass, shaped as shown in Figure 13.

To attach the motor to the hull a single base block may be used for models having a hull shell of 3/16 in. or more in thickness. Rib and plank hulls require stringers similar to those used in their prototypes. They are made as long as possible and thus distribute the motor strain over a larger area than could be done by a single block.

The motor must be lined up perfectly with the propeller shaft although the coupling between them is flexible. The aligning is done by shaping the motor base to the angle of the propeller shaft. The alignment may be tested by using an inch length of metal tubing as a temporary coupling. One half of its length must be machined to fit snugly over the motor drive shaft and the other over the propeller shaft. Place the coupling on one shaft and push the propeller shaft forward. A perfect alignment is indicated if both shafts meet in the coupling without binding. Then the motor may be fastened permanently and a flexible coupling substituted for the temporary one. Flexible couplings may be made in a number of ways. A very simple and substantial one is shown in Figure 14.

The size and shape of the rudder and its position are indicated in Figure 12. It may be made of sheet metal, properly laid out and bent around a bronze rod of the diameter shown. Solder is used to hold together the aft edge of the blade, and to hold the rudder post to the blade. Racing hulls usually have the rudder attached to the transom, but most others have it hung some distance forward of the stern. It is then held in place by a rudder port, which is a tube extending through the hull, and in which the rudder post turns.

The rudder port should be a tight fit through the hull. It is held in position by a metal plate soldered to the top end of the port, which in turn, is secured to the deck of the boat with screws, as shown in Figure 12.

Rudders on slow-speed models may be locked in position by a thumb nut on the top of the rudder post. On racing boats and other fast models, it is necessary to fasten a quadrant to the top of the rudder post so that the latter may be securely locked in any position.

Model Powerboat Racing

To race within American Model Power Boat Association regulations, a boat must meet certain very definite specifications. These are subject to change and it is well to obtain the latest data directly from the Association. The regulations for 1939 divide model powerboats into the following classes with these specifications:

Class	Weight	Motor Size
A	12 to 16 pounds	Steam or gas unlimited
B	7 to 12 pounds	Steam unlimited Gas - 50 c.c.* for multi-cyl. 30 c.c.* for single cyl.
C	5 to 7 pounds	Steam unlimited Gas - 15 c.c.*
D	Not over 5 pounds	Gas - 10 c.c.*

Model speedboat rating table. All boats must come within the class range in both weight and motor size. *c.c. — cubic centimeter

The bore and stroke may vary as long as the displacement comes within the class range of the rating table.

The formula for converting to cubic centimeter the displacement of a motor whose bore and stroke is given in inches is as follows:,

c.c. displacement = bore × bore × .7854 × stroke × 16.39.*

The boats are raced singly over a circular course by a cord of 52 ft. 6 in. long which is measured after a 10-min. immersion in the water during which time it is subjected to a 10-lb. pull. The cord is attached to a swivel which is supported 48 in. above the water. Three laps constitute a race. To figure the miles per hour divide 675 by the time taken for the three laps.

*16.39 = number of cubic centimeters per cubic inch.

PROGRESS AND GRADING CHART

C. M. REDMAN

Senior High School

Port Arthur, Texas

The progress and grading chart shown in Figure 1 was devised for and is used in general metal classes. It assists greatly in keeping an accurate record of the many projects a student works on in the course of the grade period.

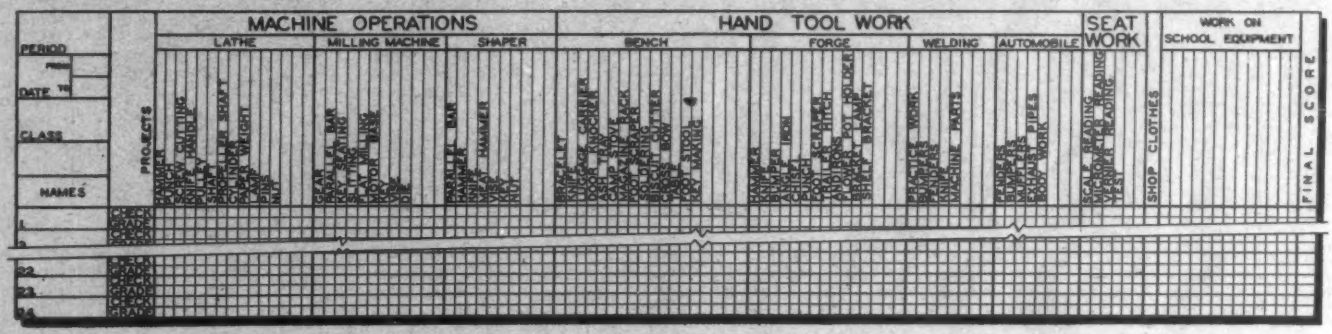


Fig. 1. Progress and grading chart submitted by C. M. Redman, Port Arthur, Tex.

These charts are mounted on plywood, as shown in Figure 2, so that pupils may keep a check on the work they have finished and the grades they have earned.

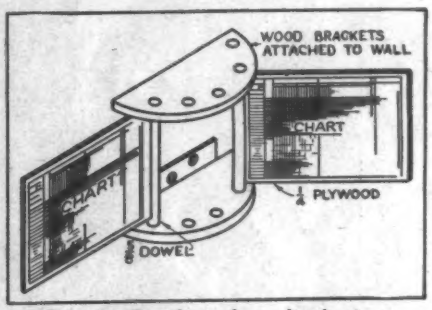


Fig. 2. Bracket for displaying progress and grading chart

HEAVY DUTY FABRICATED WHEEL PULLER

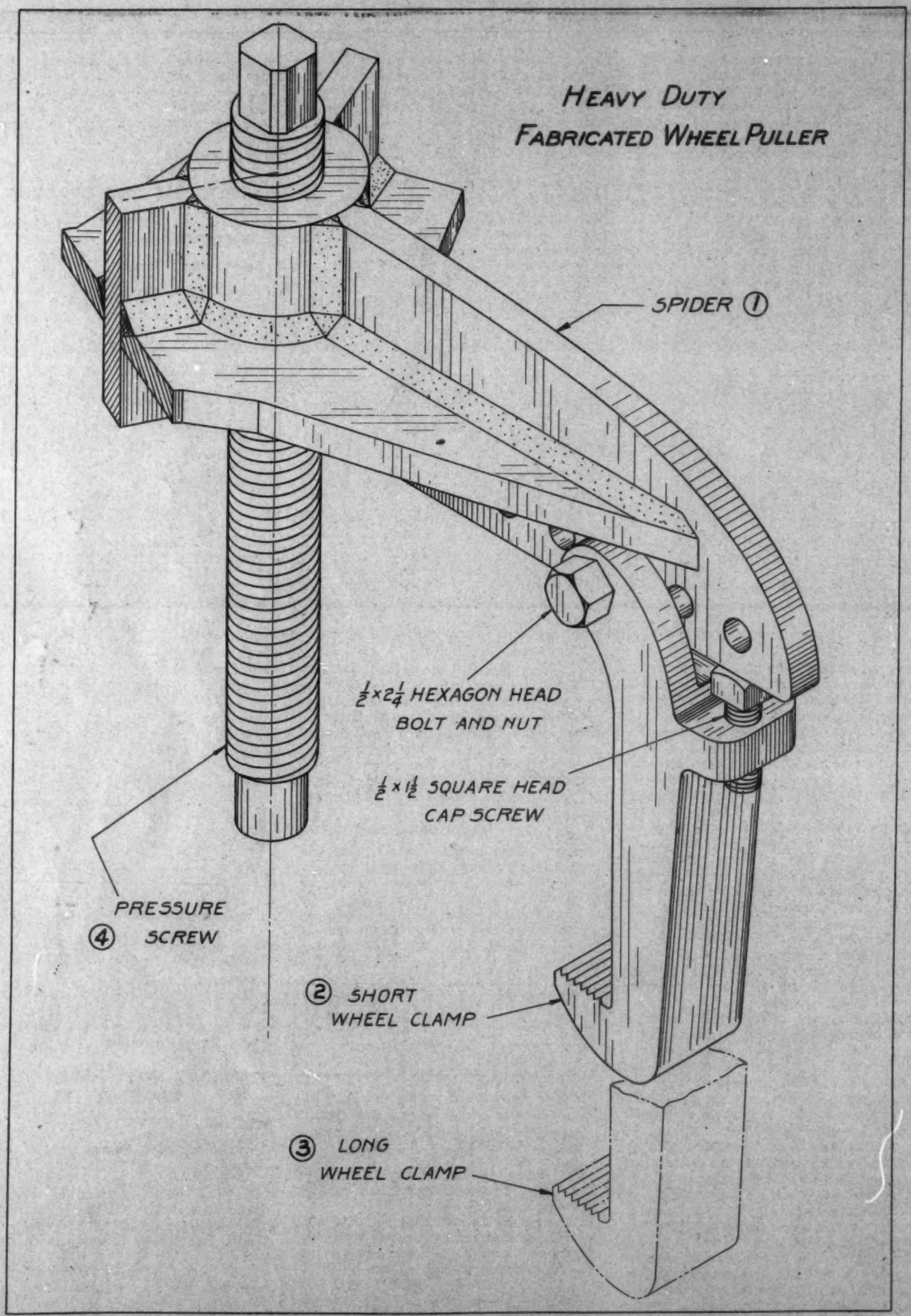
WILLIAM A. DEVETTE

Technical High School

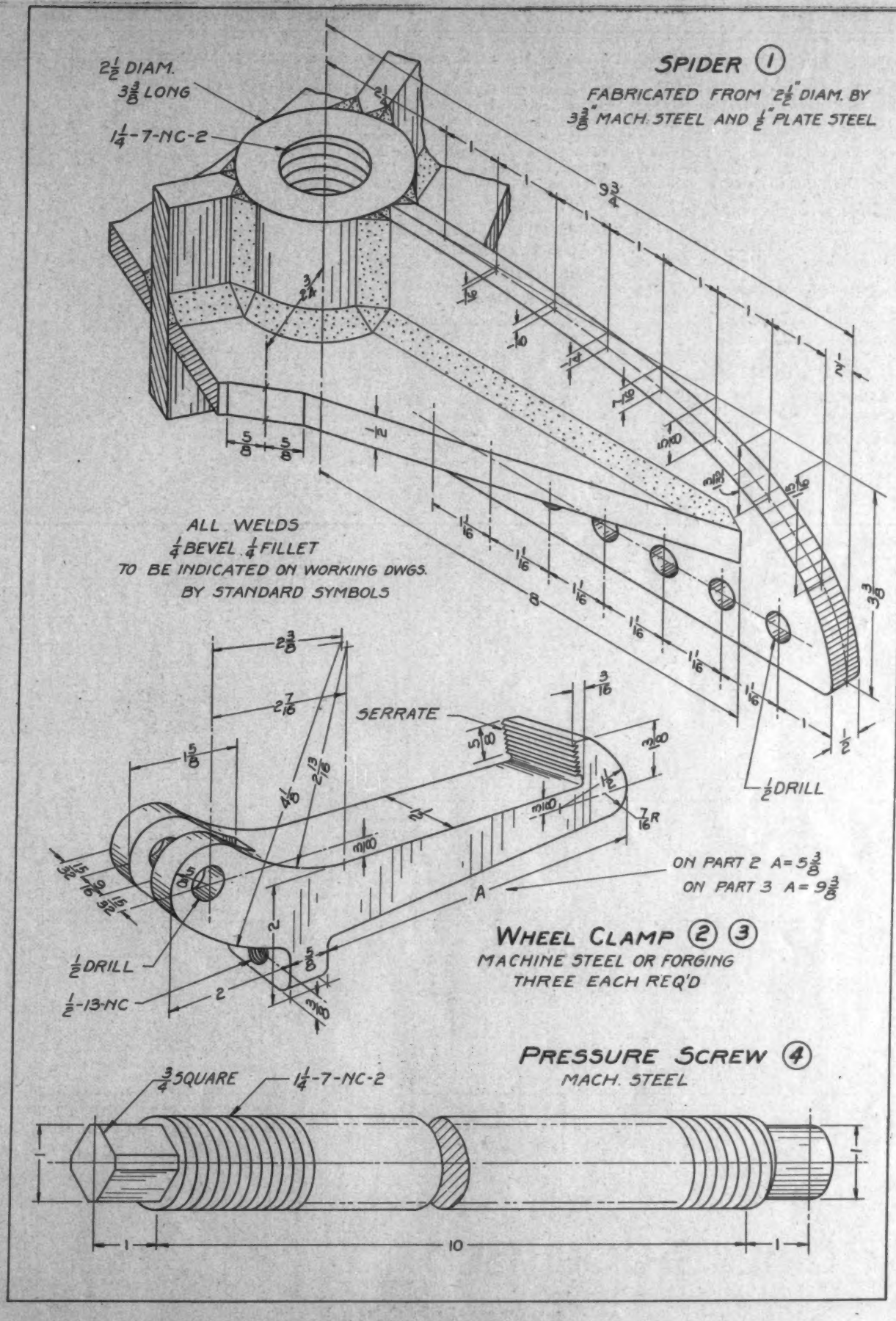
Erie, Pa.

A wheel puller capable of pulling large wheels from heavy shafting is often needed by the maintenance department of the school system. Such a tool is shown in the illustration.

The frame, or spider, is fabricated from ½-in. steel plate by welding three arms to a central hub and reinforcing them by welding webs between the plates. Before welding, holes are drilled in the arms to make the



Heavy duty wheel puller by William A. DeVette



Details of heavy duty wheel puller

wheel puller adjustable to various hub diameters.

The pressure screw is made of machine or cold rolled steel. Interchangeable sets of long and short arms are made to suit a variety of jobs.

The entire project is presented in perspective so the drafting classes may have a live project for which to make working drawings. Projects in fabricated work are all too scarce in drafting classes and when the students find themselves faced with fabrication drawing after going into an industrial drafting room, most of them have no idea what it is all about.

Welding drawings have been so standardized that welds are now completely described by single symbols and with these the drafting student should be made familiar.

CHILD'S DOLL BED

LOUIS BAROCCI
High School
Cudahy, Wis.

The doll bed shown in this article was made of 13/16-in. birchwood. The construction is simple enough that a beginning high school student can build it. All fastenings are with No. 10 by 1¼-in. f.h. screws, counterbored and covered with birch screw hole buttons. The buttons can be purchased from an industrial-arts supply firm. Our school keeps an assorted supply on hand at all times. The project was finished in natural tones, merely shellacking and then applying one or two coats of transparent gloss varnish. Pine lumber, 13/16 in. thick, also is suitable for this project.

CARPENTER'S SCAFFOLD BRACKET

CHARLES F. ZAENGLEIN
High School
Circleville, Ohio

The scaffold bracket shown in Figure 1 is safe, and it is not difficult to build. A good strong light wood should be used for its construction, such as poplar, spruce, or fir.

A small recess is chiseled into the horizontal and vertical pieces to receive the brace member, which is screwed to both pieces.

The iron plate should have five slotted holes at each end in order to slip over nailheads which have been driven into the side of the building to within about a fourth of an inch. The iron plate will then slide down under the nailhead in the narrow slot. See

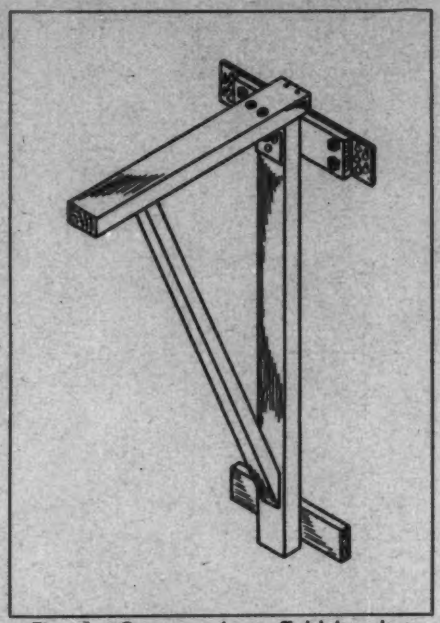
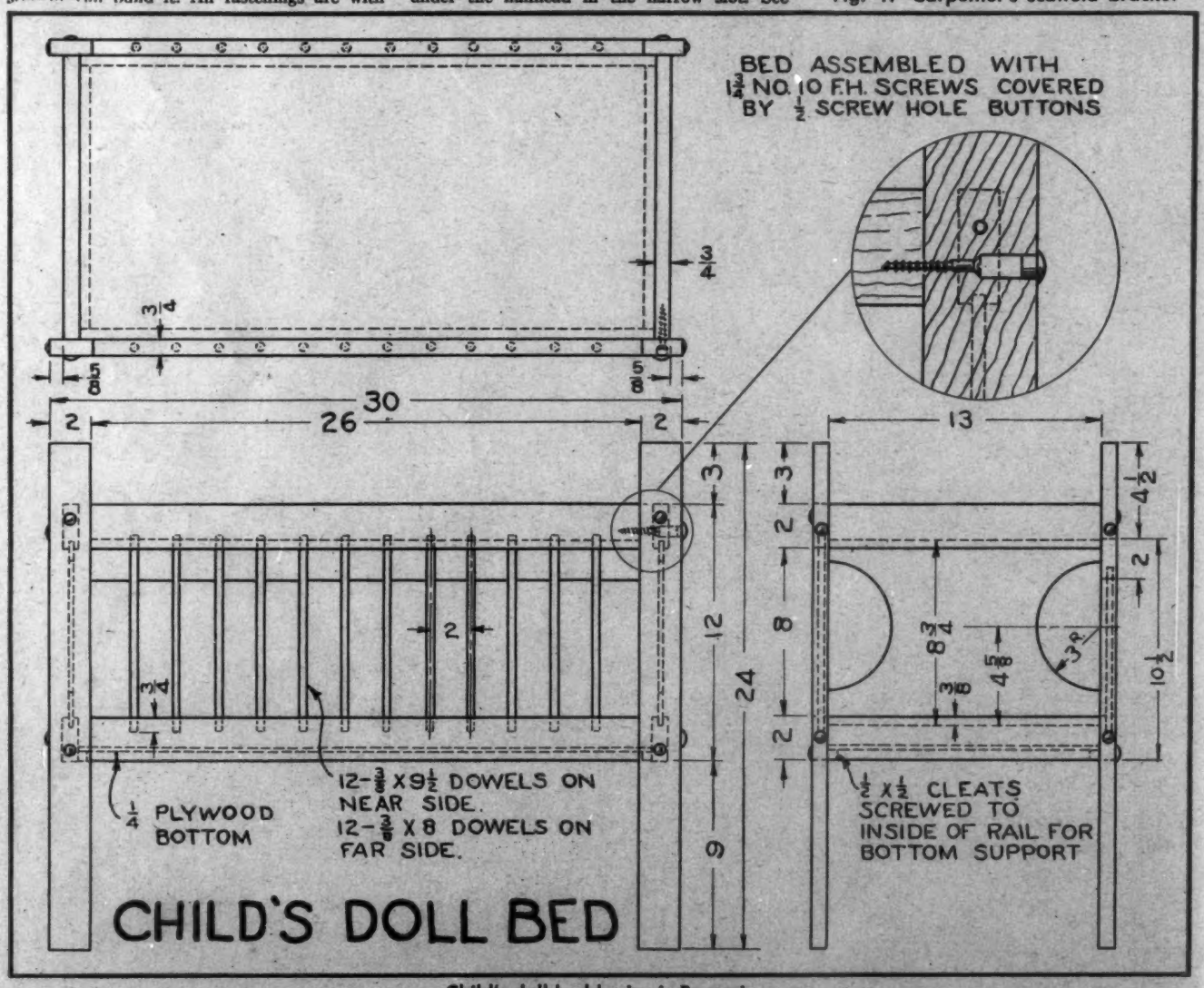


Fig. 1. Carpenter's scaffold bracket



Child's doll bed by Louis Barocci

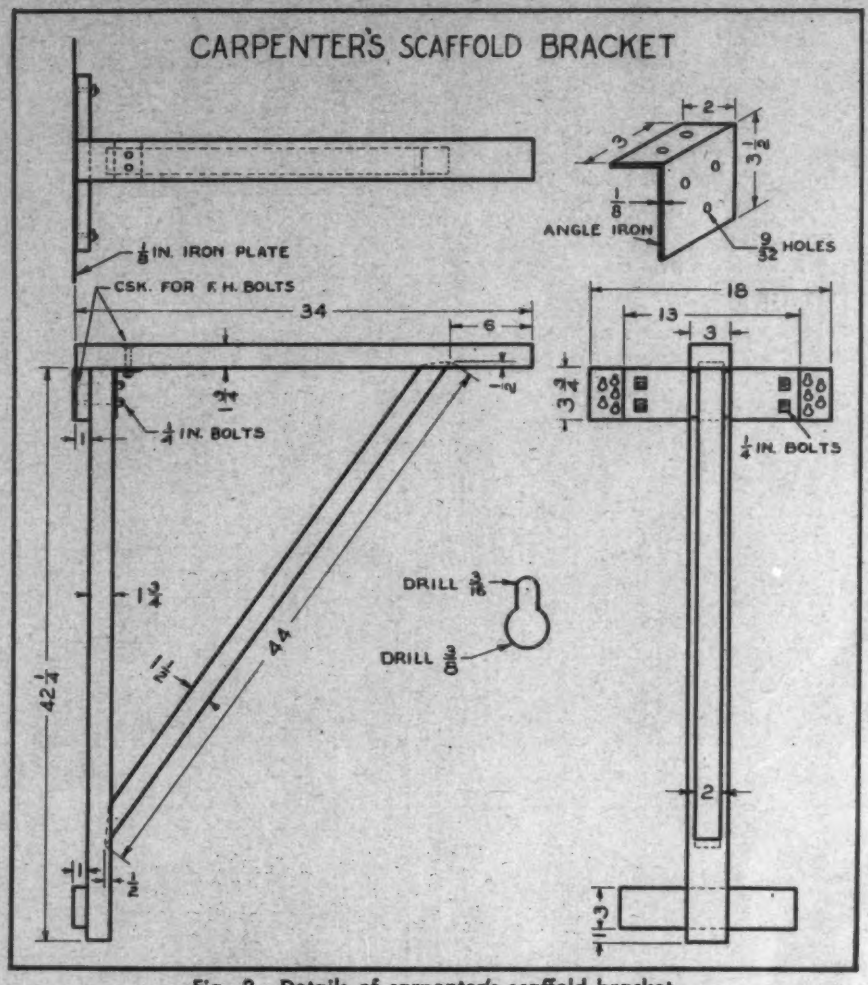


Fig. 2. Details of carpenter's scaffold bracket

detail in Figure 2. The brackets can be removed very quickly without redrawing the nails.

Three or more should be constructed depending on the nature of the work. They should be given several coats of paint.

BILL OF MATERIAL

No. of pcs.	*Name*	*Size*
1	Upright	1¾ x 3 x 42¼ in.
1	Brace	1½ x 2 x 44 in.
1	Top	1¾ x 3 x 34 in.
1	Top crosspiece	1 x 3¾ x 13 in.
1	Bottom	1 x 3 x 13 in.
1	Angle iron	⅛ x 3 x 5½ in.
1	Iron plate	⅛ x 3¾ x 18 in.
3	F.h. machine screws	¼ x 3½ in.
2	F.h. machine screws	¼ x 2 in.
4	F.h. machine screws	¼ x 1¼ in.

HOW TO MAKE A PLUG CUTTER

MORRIS ADLER

High School of Science

The Bronx, New York

One of the very common techniques in woodworking is fastening wood with screws. There is always the problem of whether to let the screw head show, whether to countersink deeply and putty over the head, or whether to counterbore for the screw head and hide the head with a plug made of wood. The last-named method is by far the most superior from the viewpoint of ease and craftsmanlike finish.

It is very desirable for every shop to have two sizes of wood plugs available: ⅜-in. diameter and ½-in. diameter. The disadvantages with plugs that are purchasable are that they cost too much. In addition, purchased plugs will not match the grain of the wood in color. Also, if an uncommon wood is used, plugs to match these woods cannot be bought at all. Therefore, it can easily be seen that it is advantageous to make your own plugs that cost little or nothing, match grain perfectly, and can be had when needed.

The plan for the plug cutter project has several other good features.

1. It is a good tool for all shops to own, whether they be school shops or home workshop.
2. It can be constructed easily out of scrap tool steel.
3. It is possible to utilize the very scraps of the stock being used, so as to insure perfect color matching.
4. It is a simple but comprehensive machine-shop project.
5. It also provides opportunity for learning of heat treatment.

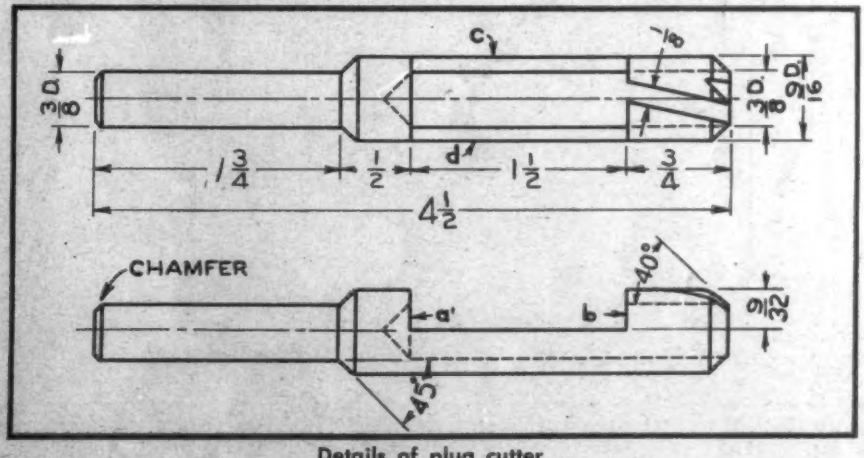
Procedure in Making a Plug Cutter

1. Secure a piece of ⅝ by 4½-in. round steel.
2. Place the stock in a universal chuck allowing 2 in. of the stock to project for turning.
3. Turn the end, which is to be the shank, to ⅜ in. This diameter may be reduced to ¼ in. if the largest chuck in the shop will only accommodate this size.
4. Place the completed shank in the chuck; reduce the remainder of the stock to 9/16-in. diameter.
5. Drill the stock with a ⅜-in. drill, using a very slow feed in order to get a smooth finish inside the hole.
6. Now turn both angles, one for the cutting edge of the tool, and the other between the shank and the body of the cutter.
7. Mark off the portion of the body to be cut away. This can be done easily on a milling machine or on a shaper. If either of these is not available, hack saw down on the lines *a* to *b* and to half the diameter of the stock. Now drill along lines *c* and *d*, and with a cold chisel, chisel through drilled portion and finally file the rough edges smooth.
8. Lay off the ⅛-in. wide slot that extends from the cutting edge to the cutaway portion of the cutter. Cut with a hack saw and file.
9. Now file the one cutting tooth as shown in the illustration.

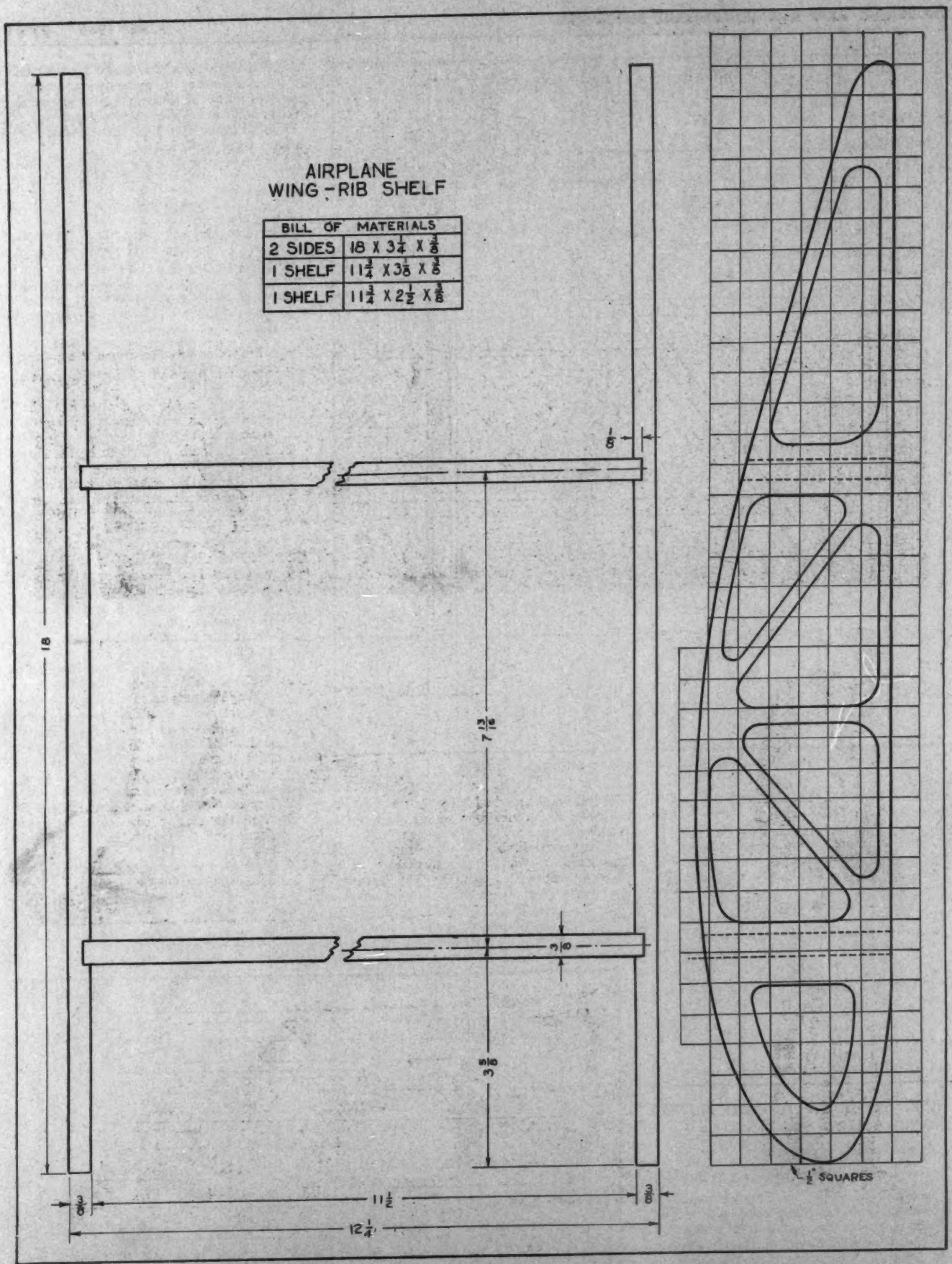
Heat Treatment

1. Heat the tool until the cutting portion of the tool is a cherry red, then quench it rapidly in cold water.

(Continued on page 276)



Details of plug cutter



Wall shelf designed by Isadore M. Fenn, Chicago Vocational School, Chicago, Ill.

WHITTLING-JACKKNIFE TECHNIQUE

W. BEN. HUNT

Hales Corners, Wis.

(*Continued from page 224 of the May, 1946, issue*)

"Houn' Dawg"

Every now and then one sees whittled caricatures of animals that are amusing and refreshing departures from the prosaic type of work which tries to copy nature more or less closely. These caricatures permit much freedom of design and are, therefore, a lot of fun to whittle. While most of us are not cartoonists, we can nevertheless find many ideas among the cartoons found in magazines and books, which may be copied or adapted as whittling projects. Since these figures are to be caricatures, the one who is doing the whittling can go ahead boldly without worrying about the outcome.

These caricatures, or cartoons, if you care to call them that, will be interesting no matter how grotesquely and impossibly they are whittled. Most likely one would not want a "houn' dawg," such as the one shown in Figures 208 and 209 running around the house, but this particular specimen looks very well on the table in the den, or on the whatnot shelf in the living room, and it will attract attention.

Not much need be said about whittling this dog. The grain of the wood runs horizontally. The whittler can exaggerate the dog's features still more if he wishes. For instance, he may be made thinner or heavier, or other changes may be made to suit your liking. No matter what you do, it will be quite certain that you will have a funny looking pooch when you have finished.

As to the coloring — that may be left to the judgment of the whittler, but white with liver colored spots (probably leaving the natural wood to take the place of the white and using brown for the spots), produces a very nice ornament.

Fig. 208. Right and left-hand views of the "houn' dawg"

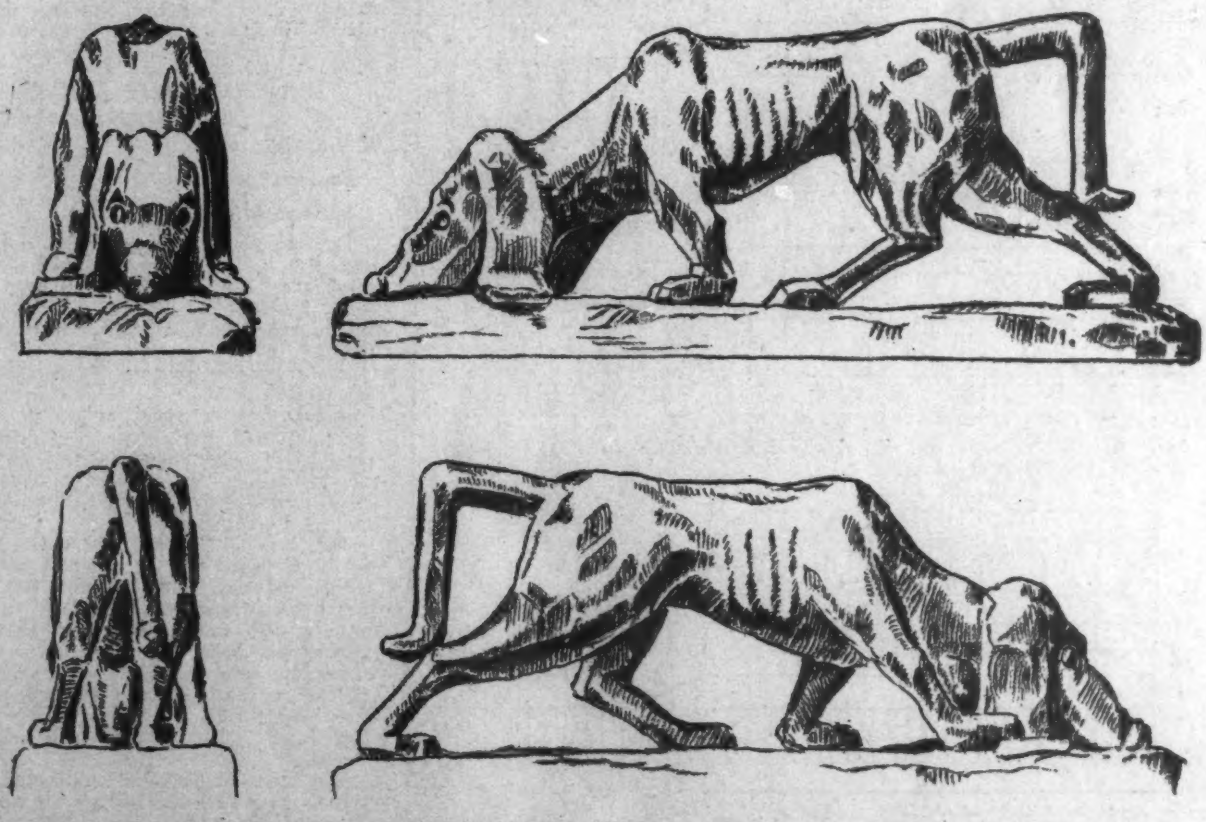


Fig. 209. Full-size patterns of the "houn' dawg"

PLUG CUTTER

(Continued from page 273)

2. Polish the cutting edge with emery cloth.
3. Heat the center of the tool until the beginning of a purple color reaches the cutting edge. Quench.
4. Grind and whet the cutting edge.
5. Test.

Note: By drilling a ½-in. hole and adding to the outside dimensions, a ½-in. plug cutter can be made as well.

How to Use the Tool

Place the plug cutter in a drill press or power drill of any kind. Place the stock from which the plug is to be cut flat on the drill press table, but resting on a piece of scrap wood. Press the cutter into stock and the plug will fall out from the half section.

Apply glue to the plug and drive it into the hole bored for it. Be careful to match direction of grain. After the glue is set, remove surplus part of plug with a chisel and sand level.

SOMETHING TO HELP RELOCATE HOLES

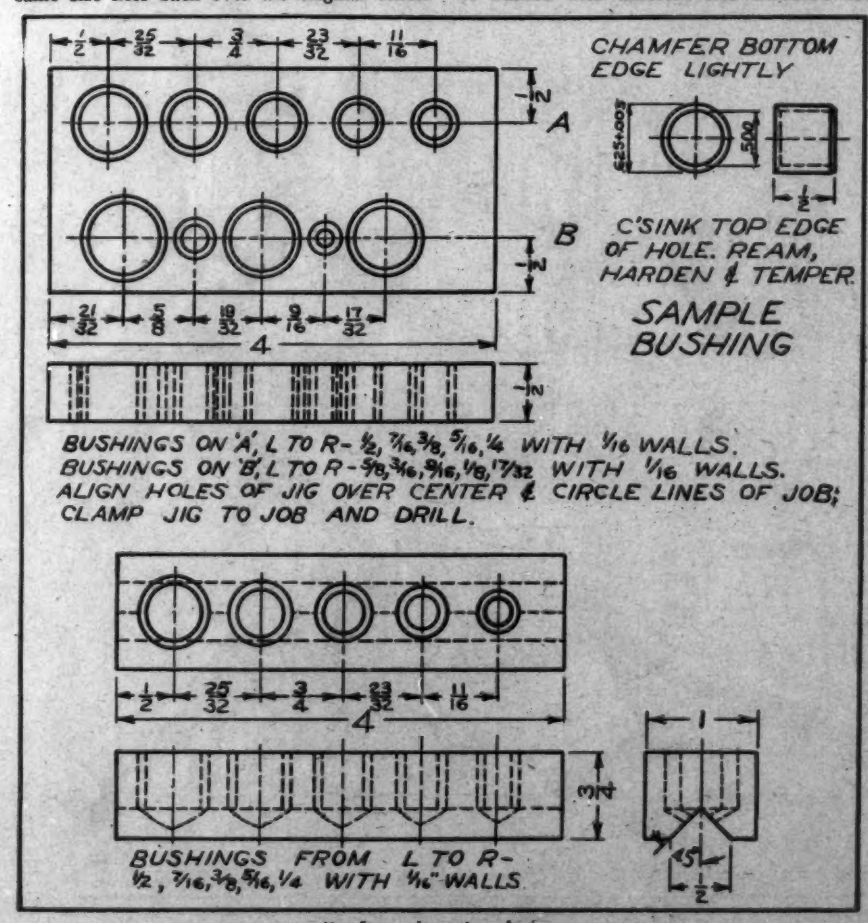
EDWARD G. SENKEWITZ

Public Schools

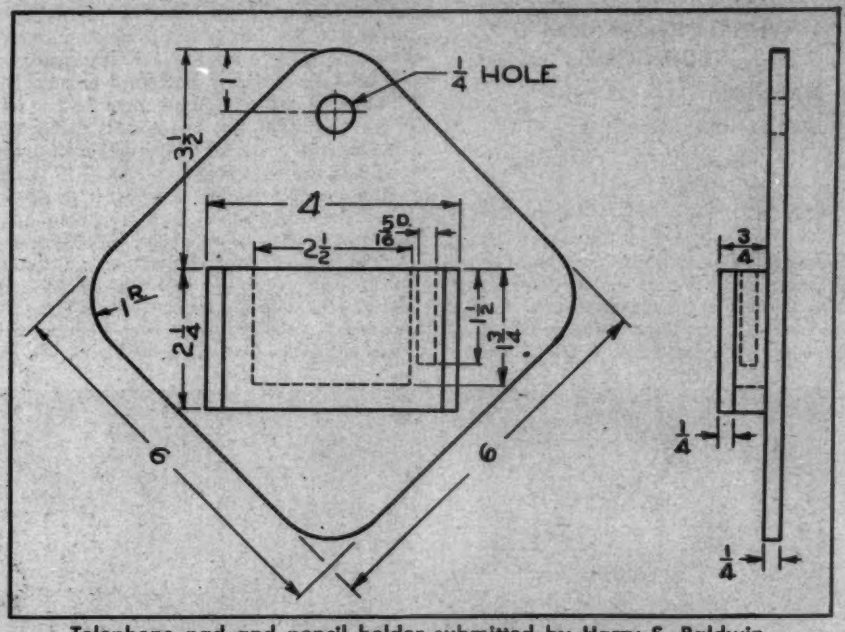
Pittsburgh, Pa.

Here is an idea that may save those frayed edges of your nerves caused by boys drilling holes off center. Of course, it will not put the same size hole back over the original center lines. It will, however, give you a fast way to save the job. This is an idea of a hole-aligning jig, and it is nothing more than a piece of steel plate drilled with various size holes or bushed with different size hardened and tempered bushings, all of which are set and drilled to suit your needs. The sketches herewith are only to help explain the idea.

Of course, there is always one bad feature about every good idea; when using this drill jig, flat-nose drills must be used. This is necessary because drills are pointed so that they will center themselves. If, then, you use a pointed drill, the drill will slide off the edge of the hole causing the drill to break.


CHAMFER BOTTOM EDGE LIGHTLY
C'SINK TOP EDGE OF HOLE. REAM, HARDEN & TEMPER.
SAMPLE BUSHING
BUSHINGS ON 'A', L TO R- ½, 7/16, 3/8, 5/16, ¼ WITH 1/16 WALLS.
BUSHINGS ON 'B', L TO R- 5/8, 3/16, 9/16, 1/8, 1/32 WITH 1/16 WALLS.
ALIGN HOLES OF JIG OVER CENTER & CIRCLE LINES OF JOB; CLAMP JIG TO JOB AND DRILL.
BUSHINGS FROM L TO R- ½, 7/16, 3/8, 5/16, ¼ WITH 1/16" WALLS

Jig for relocating holes



Telephone pad and pencil holder submitted by Harry S. Baldwin, General Mercer School, Toronto, Ont., Canada

DUNCAN PHYFE SWIVEL ARMCHAIR

A. R. CADE

Senior High School

Springfield, Mo.

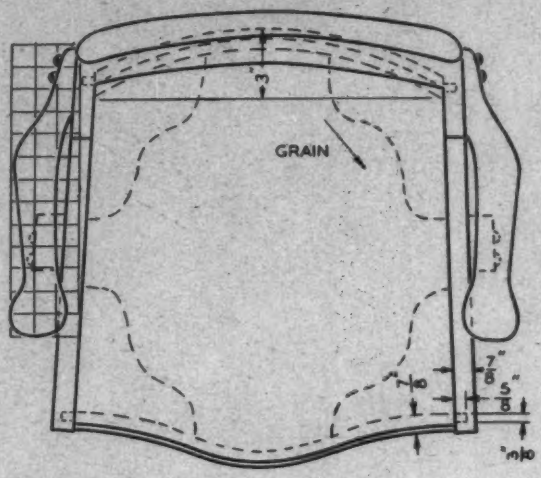
The swivel armchair illustrated and described in this article was designed to fit in with other Duncan Phyfe furniture. The swivel hardware for the chair can be taken from a discarded swivel chair, organ stool, or the like.

The cylindrical support of the base is laminated with five 1-in. pieces, each glued crossgrained to the other. The legs are fluted and metal toes attached, which is a characteristic of Duncan Phyfe. The legs are cove cut at the joint and fastened with dowels. For added strength a metal crosspiece is fastened to the bottom.

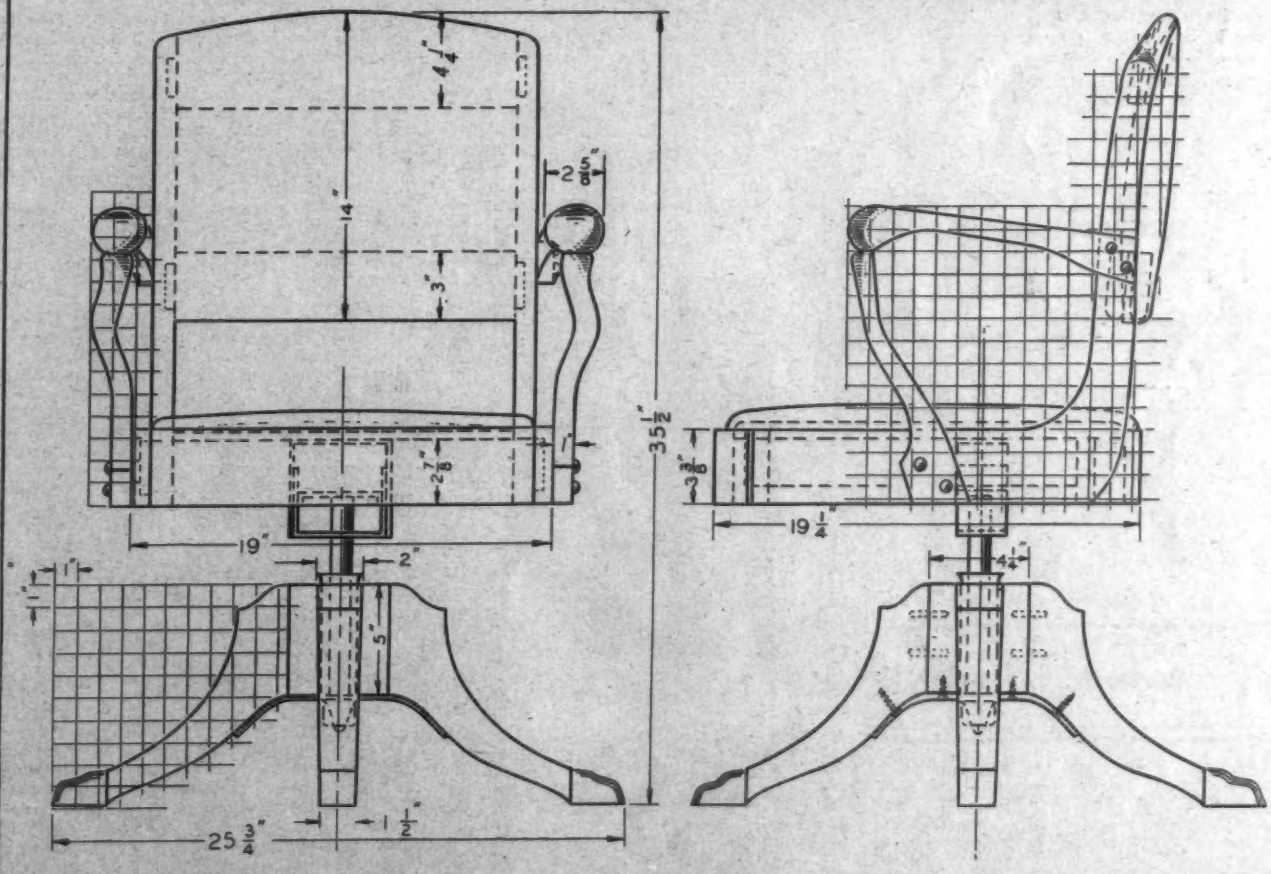
The frame for the upper part can be layed out by using the squaring method. There are mortise-and-tenon joints between the back supports and side rails. The arms can be made of six 1-in. pieces of stock glued together, crosslapping at the corner of the intersection to insure strength. The arms are fastened to the frame with glue and screws. The holes for the screws are counterbored and plugged with oval headed plugs made on the lathe.

The seat and back are upholstered with cotton and cloth before the outside covering is put on. The back is covered with webbing between the back rails. The seat is made of 13/16-in. softwood. The front and back edges of the seat are rabbeted leaving a lip of 3/8

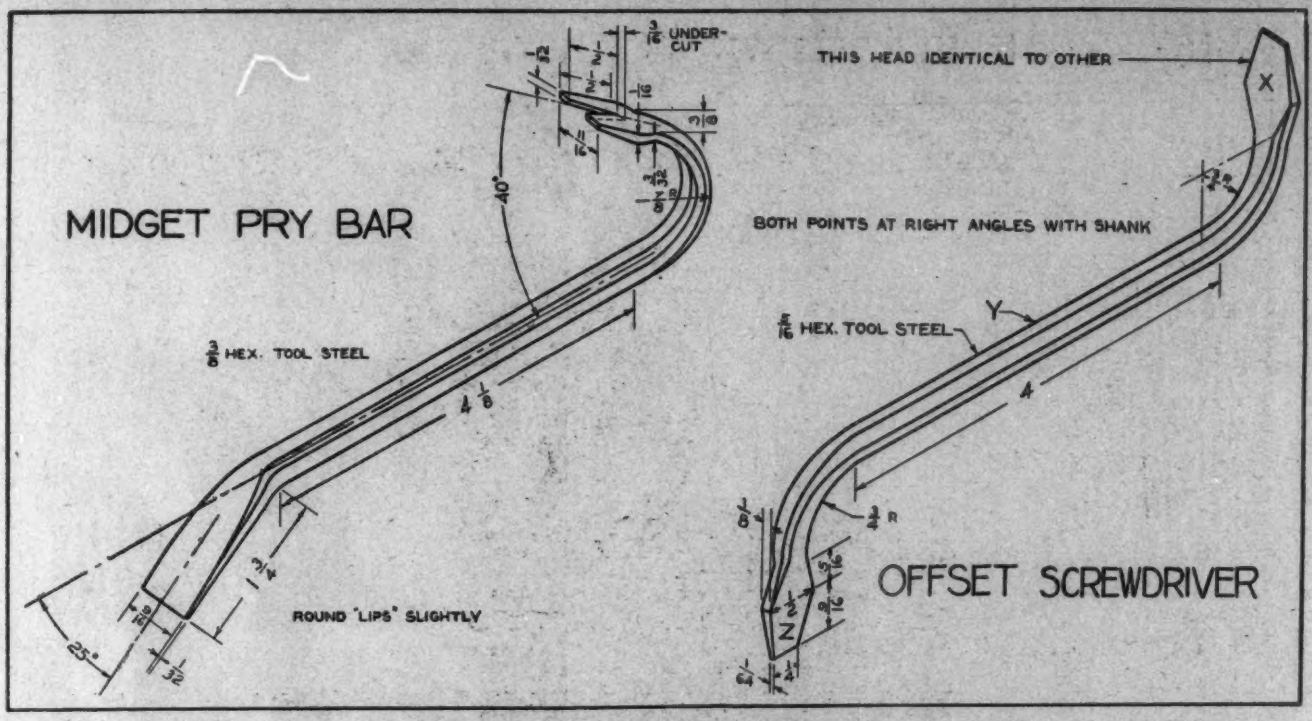
DUNCAN PHYFE SWIVEL ARM CHAIR



BACK AND SEAT UPHOLSTERED



Duncan Phyfe swivel armchair by A. R. Cade



Midget pry bar and offset screwdriver

in. overlapping on the top edge. All top edges are rounded to insure a smooth job of upholstering.

Corner blocks are fastened to the seat frame with screws and glue. Use ¼-in. carriage bolts to fasten the seat to the corner blocks.

MIDGET PRY BAR AND OFFSET SCREW DRIVER

NELSON COE

George Washington High School
Alexandria, Va.

The two forging projects shown herewith have been developed by students in our metal shop. They have been popular with the students from the standpoint of utility and economy, and with the shop department from the standpoint of metal economy.

These two projects will take the student through many forging operations. An effective finish for both tools after hardening and tempering is to polish to a mirror finish with emery and crocus cloth, and then give each an oil finish.

Personal News

♦ DR. E. C. ESTABROOKE has been appointed educational director of the American School and American Technical Society, Chicago, Ill. He assumed his duties March 1, after being released from the navy as lieutenant commander. As officer-in-charge of teacher training and training aids at the Naval Training Schools, Navy Pier, Chicago, since June, 1942, he was responsible for the training of 1450 civilian and navy instructors, and the development of over two hundred instructional manuals in the aviation, Diesel, special devices, electronics, and teacher-training fields.

He has been active in vocational education during the past 14 years, having served as vocational printing instructor in the Norfolk, Va., Public Schools; graduate scholar and part-time instructor in the Department of Industrial Education, The Pennsylvania State College; Director of Vocational Education in the Public Schools of Bradford, Pa.; and industrial education adviser, State Department of Public Instruction, Harrisburg, Pa.

Dr. E. C. Estabrooke

He received his B.S. degree in printing and publishing at the Carnegie Institute of Technology in 1932; a master's degree in education from The Pennsylvania State College in 1937; and his doctor of education degree (major in industrial education) from Penn State in 1939.

Dr. Estabrooke is the author of *Safety and Health Instruction and Practice in School Shops* (dissertation, Penn State College, 1939); coauthor of *250 Teaching Techniques* (Milwaukee: The Bruce Publishing Company, 1943); and has contributed numerous articles to INDUSTRIAL ARTS AND VOCATIONAL EDUCATION magazine, *The Phi Delta Kappan*, and the *National Safety Council Newsletter*.

He is a member of Phi Delta Kappa, Iota Lamba Sigma, American Vocational and Illinois Vocational Associations, The National Association of Industrial Teacher Trainers, The National Graphic Arts Education Association, National Education Association, and is listed in Who's Who in American education.

Dr. Estabrooke's broad experience should assist in the further development of supervised correspondence and home-study training, and in the publication of vocational books to meet specific needs in the vocational and general educational fields.

♦ DR. WILLIAM J. MICHEELS, associate professor of industrial education at the University of Minnesota, has been appointed staff consultant of the National Standard Parts Association's new headquarters department.

He will prepare all material to be used in conjunction with a continuing broad program of personnel relations. The service, constituting one of the association's major postwar activities, will go far beyond the training of salesmen or any particular group of employees. It will include the manufacturer's or jobber's entire organization and will deal with all subjects pertinent to employment, training, and supervising of employees.

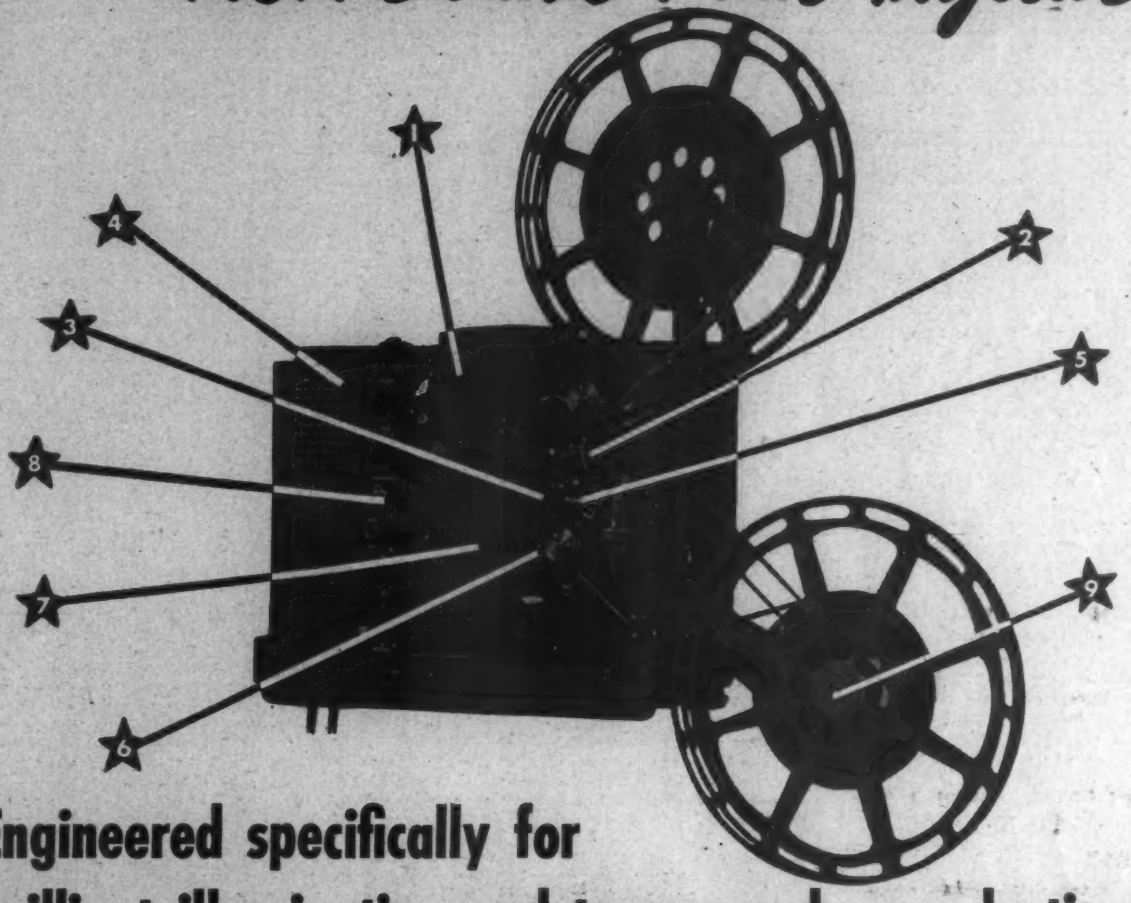
♦ O. C. HEJKAL, formerly of Des Moines Technical High School, Des Moines, Iowa, is now instructor of drafting at Memphis State College, Memphis, Tenn.

Previous to teaching in Des Moines, Mr. Hejkal was a civilian instructor in airplane mechanics at the Naval Training Station at Norman, Okla. He also served as a research specialist with the National Advisory Committee for Aeronautics.

♦ DR. PAUL C. POLMANTIER has recently been added to the staff of the University of Missouri to instruct in guidance courses. Dr. Polmantier was recently discharged from the navy after serving three years as a personnel officer. He received his doctor's degree from the University of Minnesota.

(Continued on page 16A)

NINE-STAR PERFORMANCE with the *RCA Sound Film Projector*



Engineered specifically for brilliant illumination and true sound reproduction!

1. Correctly engineered light system provides better illumination. Consists of: 750- or 1000-watt Lamp; Silver-Coated Pyrex Glass Reflector; two-element Condenser Lenses.
2. Fast two-inch, F1.6 Projection Lens—For brilliant illumination, contrast and clarity.
3. RCA Sound Stabilizer—maintains uniform film speed for sound take-off. It assures sound reproduction at the exact pitch at which it was originally recorded.
4. Powerful Four-Stage Amplifier—Utilizes "inverse feed-back" to bring you voice, music and sound as originally recorded.
5. Precision Engineered Filter—Maintains sound reproduction at exact recorded pitch.
6. 16-tooth Drive Sprockets provide for long film life.
7. Professional Theatrical Framing.
8. Provision for Microphone or Phonograph Turntable.
9. Even-Tension Take-Up—Assures automatic and uniform film take-up action.

For detailed information on the RCA Sound Film Projector, send for descriptive booklet. Write Educational Department, 40-F, Radio Corporation of America, RCA Victor Division, Camden, N. J.

RCA

EDUCATIONAL DEPARTMENT

RADIO CORPORATION of AMERICA

RCA VICTOR DIVISION, CAMDEN, N.J.

(Continued from page 278)

♦ CHARLES C. HUNT, formerly director of industrial arts at the Junior High School, Glen Ellyn, Ill., has been appointed to a position in the industrial-arts department of the Glenbard Township High School, in the same city. His work here is in the fields of auto mechanics, welding, and general electricity.

Association News

♦ The Illinois Vocational Association Convention, held April 4, 5, and 6, 1946, at the Morrison Hotel, Chicago, had for its general theme "Problems Confronting Vocational and Industrial Arts Education in the Postwar World."

On Friday, April 5, a record crowd of over 1500 people attended. The officers of the Illinois Vocational Association are Bernard F. Baker, president, 228 North La Salle Street, Chicago; H. P. Erwin, secretary, Mattoon High School, Mattoon; Laurence Britton, treasurer, Thornton Township High School, Harvey.

The Illinois Vocational Association consists of the following affiliated groups:

Illinois Art Teachers' Association: Hazel K. Brennan, president, 4000 Washington Blvd., Chicago; Ingeborg Jorgensen, secretary, 1114 N. Lorel Ave., Chicago.

Illinois Business Education Association: Bernard F. Baker, president, 228 N. La Salle St., Chicago; Neal F. Myers, vice-president, Senior High School, Quincy; Eileen C. Stack, secretary, 1313 N. Claremont Ave., Chicago; Don W. Arnold, treasurer, 216 E. Monroe St., Springfield.

Illinois Industrial Education Association: C. A. Carlson, president, 228 N. La Salle St., Chicago; L. V. Newkirk, secretary, 228 N. La Salle St., Chicago; Christian Petersen, treasurer, Lane Technical High School, Chicago.

Illinois Vocational Homemaking Teachers' Association: Jean I. Hart, president, Northern Illinois State Teachers' College, De Kalb; Sarah Miner, vice-president, Western Illinois State Teachers' College, Macomb; Doris Ray, secretary, Wethersfield Township High School, Kewanee; Hilda Roodhouse, treasurer, High School, Pana.

Illinois Association of Vocational Agriculture Teachers: Burdette Graham, president, High School, Macomb; F. A. Stansfield, vice-president, High School, Lawrenceville; M. R. Stengel, secretary-treasurer, High School, Lanark.

Ernest E. Simon, director, state board of vocational education, Springfield, Ill., presided at the annual conference of trade and industrial education for supervisors, teacher trainers, and school administrators. The problems of organizing cooperative part-time programs for development of related instruction for the G.I. and apprentice instruction were discussed at this meeting.

Friday, April 5, conducted tours took the visitors to see the vocational and industrial-arts program of the Chicago schools in action.

Illinois Industrial Education Association Luncheon Friday Noon

C. A. Carlson, president of the Illinois Industrial Education Association, presided at the Illinois Industrial Education Association luncheon. Dr. William H. Johnson, superintendent of schools, Chicago, Ill., welcomed the group to Chicago and pointed out the importance of vocational industrial-arts education in the modern school program. Following the luncheon C. A. Carlson presided at the business meeting and the following officers were elected for the coming year: president, Ernest J. Simon, director, State Board of Vocational Education, Springfield; vice-president, trade and industrial education, Martin Brauns, Jr., Washburne Trade School, Chicago; vice-president, industrial-arts education, Dale Roberts, instructor in woodworking, Maine Township High School, Des Plaines; vice-president, personnel and guidance, Dr. C. A. Michelman, supervisor of occupational information and guidance, Board for Vocational Education, Springfield; treasurer, Christian Petersen, supervisor of shops, Lane Technical High School, Chicago; members of the board of directors to serve for two years: Carl A. Carlson, supervisor in charge of technical subjects, Chicago Public Schools; Paul R. Waugh, director of vocational education, Peoria; L. L. Wingo, director of industrial education, Mt. Vernon.

Industrial Arts Section Meetings

Friday afternoon, April 5, the industrial-arts section meetings were in charge of Harmon D. Roberts, Thornton Township High School, Harvey, Ill., vice-president, Illinois Industrial Education Association. Section meetings were conducted in aviation, graphic arts, home mechanics, metalwork, and plastics.

The aviation section was conducted under the chairmanship of C. M. Hewitt, head of the department of automobile and aeronautics, Bradley Polytechnic Institute, Peoria, Ill.

Joseph Reed, C.A.A., inspection supervisor, discussed the topic, "The Requirements for a C.A.A. Approved Training School."

Following this Ernest J. Simon, director of the state board for vocational education, Springfield, Ill., spoke on the subject "Suggestions for Aviation Training in Illinois."

The industrial education section meetings on graphic arts were conducted under the chairmanship of Paul Schoenoff, industrial education department, Waukegan Township High School, Waukegan, Ill. Fred W. Swan, assistant supervisor of trade and industrial education, board for vocational education, Springfield, Ill., spoke on the topic, "Introducing the Graphic Arts." J. Tozdryk, Proviso Township High School, Maywood, Ill., discussed the topic, "Silk Screen Printing."

The home mechanics meeting was conducted under the chairmanship of George J. Jennings, Bureau of Industrial Arts, Chicago Public Schools. Thaddeus J. Lubera, district superintendent of elementary schools, Chicago board of education spoke on the topic, "A District Superintendent Looks at Home Mechanics." Mr. Lubera stated that the home mechanics courses in his district were holding the interest of both boys and girls and that they are making their contribution for intelligent living with the products of the machine age. Miss Gretta M. Brown, principal of the Horace Mann Elementary School spoke on the topic, "A Principal Looks at Home Mechanics." Miss Brown stated that home mechanics had been very successful in her school for both boys and girls in grades 6, 7, and 8 and that in addition to presenting an important curriculum content it gave life and motivation to reading, arithmetic, and language. Miss Catherine M. Kiernan, home mechanics teacher at the Parker Elementary School, Chicago, spoke on the topic, "Method and Content of Home Mechanics." Miss Kiernan mentioned that the parents of the boys and girls in her classes were enthusiastic about home mechanics because the children learned how to do practical things. She pointed out many instances where children, because of their home mechanics courses were more intelligent consumers of the products of industry and better able to co-operate with the problems of home maintenance.

The industrial education metalwork were presented under the chairmanship of Oscar H. Olson, assistant head, industrial and vocational department, East Senior High School, Rockford, Ill. E. H. Fronmelt, director of research, Kinnametal Company, La Trobe, Pa., spoke on the topic, "Cemented Tungsten Carbide Cutting Tools in the School Shop." The group also discussed aluminum and magnesium and the use of slide films and motion pictures.

The industrial education meeting on plastics was under the chairmanship of Coleman Hewitt, Bureau of Industrial Arts, board of education. M. L. Brummer, technical representative, Rohm and Haas, Inc., spoke on the subject, "Peace Time Developments in Plastics."

A. T. Belanger, development engineer, Alton Box Board Company, gave a demonstration on new craft techniques in plastics. Mr. Hewitt also presented an exhibit on typical projects made from plastics.

Trade and Industrial Education Meetings

Robert Shumway, director of vocational education, Rockford, Ill., and vice-president of Illinois Industrial Education Association organized the trade and industrial education meetings. The trade and industrial automotive meeting was under the chairmanship of H. C. Maitland, assistant department head, West Senior High School, Rockford, Ill. Jack Mundy, service manager, DeSoto, Plymouth Sales, Rockford, discussed "The Army Plan of Automotive Instruction and Its Use in Vocational Schools."

A. B. McCall, Lanphier High School, Springfield, Ill., was chairman of the industrial education drafting section. R. P. Hoelscher, professor of engineering drafting, University of Illinois, spoke on the topic of "A.S.A. Drafting Standards." H. D. Campbell, director of mechanical drawing, J. Sterling Morton High School, Cicero, Ill., spoke on the topic, "Training High School Juniors and Seniors for Industrial Drafting." Clarence N. Wandrey, chief draftsman, Zenith Radio Corporation, discussed the topic, "Industrial and School Drafting Room Relationships."

Wesley D. Golden, supervisor, woodworking, board of education, Chicago, served as chairman of the trade and industrial education woodworking section. Dr. M. Lieff, experimental engineer in wood technology, Elmdorf Corporation, Chicago, spoke on the topic, "How Can the School Woodshop Best Serve Industry."

Howard W. Smith, supervisor of foundry, welding and electric shops, board of education, Chicago, served as chairman of the trade and industrial education welding section. Walter A. Knocke, works manager, Kelly Steel Company, Chicago, spoke on the topic, "The Use of Vocational Schools in the Training and Upgrading of Personnel in Industry."

Agriculture Education

The first meeting of the agriculture education group was held Friday morning under the chairmanship of E. E. Mayhew, Chicago Heights.

Burdette Graham, president, I.V.A.T.A., Macomb, Ill., William Kuntz, president, State F.F.A., Monmouth, Ill., Ernest J. Simon, director of vocational education, Springfield, Ill., and Dr. H. M. Hamlin, head of agriculture teacher training department, University of Illinois made brief presentations before the group.

Professor H. W. Hannah, division of special services for veterans, University of Illinois, spoke on the topic, "College and the Returning Veteran." J. E. Hill, state supervisor of agricultural education, Springfield, Ill., spoke on the topic "On-the-Job Training in Agriculture for Returning Veterans."

Second Session Agriculture Education

Elmer Rowley, Joliet, Ill., served as chairman of the afternoon session. Dr. G. W. Schultz, University of Chicago spoke on the topic "Some Economic and Political Factors Affecting Agriculture." V. S. Peterson, Consultant Extension Division, E. I. DuPont Nemours & Company, spoke on the topic "Research in Everyday Living."

School Administrators' Meeting

Paul Grigsby, principal, Granite City Community High School, Granite City, Ill., served as chairman of the school administrators' meeting. The theme of the meeting was "The Responsibility of the Public Schools in Providing Vocational Educational Opportunities for Adults and Out-of-School Youth." The topic was discussed from the standpoint of organized labor, industry, business and agriculture.

Illinois Vocational Association Banquet

The Annual Illinois Vocational Association banquet was held Friday evening at 6:30 p.m. in the Terrace Casino of the Morrison Hotel. Bernard F. Baker, president of the Illinois Vocational Association was chairman of the meeting. Ralph S. Foss, McGraw-Hill Book Company, Inc., New York, served as toastmaster. Dr. William H. Johnson, superintendent of schools, Chicago, extended greetings to the guests. Dr. D. Wayne Orton, director of education, International Business Machines Corporation, New York, addressed

(Continued on page 18A)

Douglas Fir Plywood Again Allocated

-To Meet the Urgent Needs of the Reconversion Housing Program

TODAY'S most urgent and immediate need is for housing—and the Douglas fir plywood industry pledges complete cooperation with the Reconversion Housing Program.

The demand for housing requires that Douglas fir plywood again be put on an allocation basis. This means that a substantial proportion of the industry's production will be channelled to housing contractors, stock cabinet manufacturers, prefabricators and distributors.

As a result, the present supply situation for all other industrial and construction uses will be temporarily aggravated.

May we strongly urge you to anticipate your needs *far in advance*—and discuss your requirements with your regular sources of supply.

Even though today the supply situation in Douglas fir plywood is critically short, for many projects such as forming concrete surfaces, for signs and display work, for boat building, and for many other industrial and commercial uses, it is almost indispensable. In these cases it is well worth waiting for, as it will save time and labor and do a better job.

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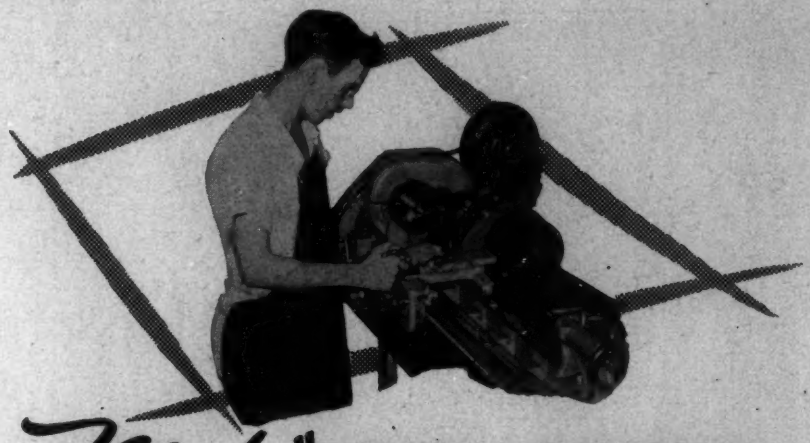
LARGE, LIGHT, STRONG,
Real Wood
PANELS

Douglas Fir Plywood Association
Tacoma 2, Washington



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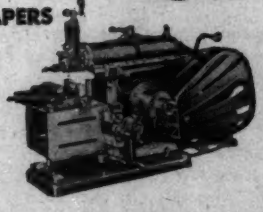

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(Continued from page 16A)

the banquet audience on the topic "The Future of Vocational Education." Dr. Orton placed first emphasis on the need for a well-integrated and well-rounded education for everybody including adequate vocational training.

Following the address the Ship took over the program and presented prizes. Following the presentation of the prizes there was dancing.

Saturday Morning — April 6

Agriculture, home economics, personnel and guidance, industrial arts and trade and industry conducted departmental meetings.

Emory Holt, Peotone, Ill., was chairman of the agriculture departmental meeting. Dr. H. C. M. Case, education department of the agricultural economics, University of Illinois, spoke on the topic "Our Stake in the European Food Situation." J. E. Hill, state director of agricultural education, Springfield, Ill., discussed the topic "New Developments in Vocational Agriculture."

Sarah Miner, Western Illinois State Teachers College, Macomb, Ill., was chairman of the home economics education departmental meeting. Mrs. Genevieve Crouse of Tolono, Ill., spoke on the topic "Interest Appeal of Teacher Planned Units." Lela Mae Ping, Sadorus, Ill., discussed "Planning to Teach Child Care and Development at Different Levels in Secondary Schools."

Maurice E. Giles, vice-president, personnel and guidance of the Illinois Industrial Education Association, served as chairman of the meeting. C. A. Michelman, state supervisor of occupational information and guidance, board for vocational education, Springfield, discussed the topic "Guidance Techniques for all Teachers."

Harmon D. Roberts, Thornton Township High School, Harvey, Ill., vice-president, industrial education, Illinois Industrial Education Association was chairman of the industrial education section meeting. Frank C. Moore, director of industrial arts, Cleveland, Ohio and vice-president of the American Vocational Association, discussed the topic, "Industrial Arts, What For?" Mr. Moore stated that industrial arts should be a fundamental part of education for everybody. Mr. Moore emphasized that pupil learning in industrial arts should take place at least 75 per cent of the time when the students are actively engaged with tools, machines, and materials.

Robert Shumway, director of vocational education, Rockford, Ill., was chairman of the departmental meeting for trade and industry. J. C. McCarthy, secretary, National Furniture Manufacturers' Association, Chicago, spoke on the topic "What the Furniture Making Industry Offers to the Young Man in the Way of a Vocation."

Ernest J. Simon, director, board for vocational education, Springfield, discussed the topic "Implications for Trade and Industry Programs in the G.I. Bill of Rights."

Commercial Exhibits

The Illinois Vocational Association had the largest number of commercial exhibits in its convention history. The following firms were represented: American Technical Society, American Type Founders, Brodhead-Garrett Company, The Bruce Publishing Company, Castle Films, Comptometer Corporation, Delta Manufacturing Company, De Vry Corporation, Dictaphone, Ginn & Company, General Finishes Sales and Service Co., Gregg Publishing Company, Heath, D. C., and Company, Houghton Mifflin Company, Jam Handy Organization, The King Company, Macmillan Company, Manual Arts Press, Marchand Calculating Machine Company, McGraw-Hill Book Company, Inc., McKnight and McKnight, Midwest Visual Equipment Co., Monroe Calculating Machine Co., Morgan Dillon & Co., Pitman Publishing Company, Prentice-Hall, Inc., Sheldon Machine Co., Inc., Science Research Associates, South Bend Lathe Works, South-Western Publishing Co., Stanley Tools, Starrett, L. S. Company, U. S. Plywood Corporation, Van Nostrand Company, D., Inc., Weidenhoff, Joseph, Inc., Western Materials Company.

Educational Exhibits

Paul Rohe of J. Sterling Morton High School, Cicero, Ill., and W. P. Klingensmith, supervisor of industrial arts, board of education, Chicago, were chairmen of the state and local educational exhibits committees.

The schools responded well and there were exhibits in home arts, business education, drafting, home mechanics, woodworking, metalworking, dressmaking, cobbling, millinery, aeronautics, ceramics, and plastics. The size of the projects were somewhat smaller than usual because of the shortage of construction materials.

The Illinois Vocational Association is the largest state association in America and alternates its yearly meetings between Chicago and downstate.

♦ The eighteenth annual convention of the Michigan Industrial Education Society was held at Grand Rapids, Mich., on April 11, 12, and 13, 1946.

Meeting with this organization were the following: the Michigan Vocational Association, the Michigan Home Economics Association, the Michigan Association of Teachers of Vocational Agriculture, and the Michigan Vocational Business Education Society.

On Thursday, April 11, the Michigan Association of Teachers of Vocational Agriculture held their meeting with the Michigan Vocational Association. Archie P. Nevins, president, Michigan Vocational Association, presided, and Mr. Babcock led the discussion of the new Michigan state plan. At 7:30 p.m. a general session was held under the chairmanship of John Amiss, vice-president, Michigan Vocational Association.

Robert C. McLaughlin, division of education, Michigan Department of Conservation, gave a movie talk on "Our Michigan."

At 8:00 a.m. Friday the administrators' breakfast was held. O. Frank Carpenter, principal, Wilbur Wright Co-operative High School, Detroit, acted as chairman, and Donald Armstrong, supervisor of music, Grand Rapids Schools, gave a delightful series of musical anecdotes.

(Continued on page 21A)

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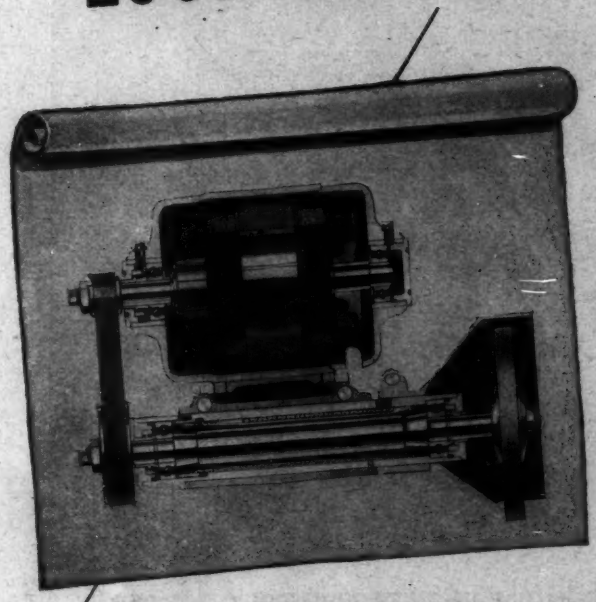

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During these years this original service has grown in scope and usefulness both to instructor and student. The latest innovation, the transparent Eldoradostat, making it possible for the instructor to reproduce as many blueprints as desired, is only one example.

Plans are in the making to extend this service and these plans will be announced in the early fall. Instructors now on our mailing list will receive the announcement.

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(Continued from page 18A)

The annual town hall meeting was held at the 9:30 a.m. session. Maurice H. Pancost, president, Michigan Industrial Education Society, was the chairman, and Earl Bedell, divisional director of vocational education, Detroit Public Schools, as usual was the peerless moderator who knows how to conduct this kind of meeting but also how to get the audience to co-operate. The questions discussed were House Bill 4384; the obligation of the teachers of industrial arts and vocational education to know the philosophy of their offerings, and how to sell their subjects to the general educators and school superintendents.

The subject of surplus commodities also was discussed.

Marshall Byrn, associate professor, School of Education, University of Michigan, presided at the industrial-arts section meeting held Friday afternoon.

Ralph C. Wenrich, lecturer in vocational education, University of Michigan; formerly lieutenant-colonel, U. S. Army; chief of preinduction branch, headquarters army service training, spoke on "Does Your Industrial Arts Program Meet the Needs of Secondary School Boys?" He emphasized that the modern boy needs to have an educational environment which interprets to him what science and industry really is. Industrial arts is an ideal subject for doing this, as well as to give him an opportunity to develop some skill, develop desirable attitudes, gain vocational guidance facts, know something about a variety of materials, and gain some mastery of self.

A panel discussion on "Gearing Industrial Arts to Postwar Needs of American Youth," followed.

The annual banquet on Friday evening was presided over by Maurice H. Pancost, and Earl Bedell acted as toastmaster.

The speaker on this occasion was Dr. Ralph L. Lee, General Motors Corporation, who discussed "Humanics in Industry." The speaker in his inimitable way said that teachers were the molders and builders of the most precious materials on earth. He deplored that there were no humanometers for measuring human elements, similar to the micrometers which won the war for us.

Since there is no standard scheme which fits all students, teachers must treat each student as a separate and distinct individuality that changes from day to day, and must be studied carefully and continually.

T. Arthur Trealor, teacher in the High School, Petosky, Mich., was awarded the M.I.E.S. master-teacher award for his outstanding work.

Saturday morning was given over to round-table meetings on administration and supervision, aviation and auto mechanics, co-operative and apprenticeship training, drawing, electricity and radio, metalwork, plastics, printing, rural and general shop, and woodwork.

The Ship's luncheon was presided over by Dr. Frank Dalton, lecturer in vocational education, School of Education, University of Michigan.

Colonel Lester Doerr acted as toastmaster.

In his address on "What Price Security," Dr. Floyd E. Armstrong pointed out many dangers that surround us now because of the shortcomings of those in power at Washington. He deeply deplored our appeasement policy and the efforts that are being made toward engulfing us farther and farther into American statism.

He advocated that we must again learn to rely on ourselves; that we must maintain our power as Russia is doing for herself; that we must be firm — not tough; that we must be just as aggressive as Russia; and that American business and industry must make capitalism function better than it has done in the past, and than it does now.

Deck Officer Lew Webb, American Technical Society, Chicago, Ill., then took over in the distribution of the Ship's prizes which had been contributed by the various firms that had exhibits at the convention.

Officers for the new year are: president, Dr. Frank Dalton, University of Michigan, Ann Arbor, Mich.; vice-president, Claude Bosworth, director of industrial education, Muskegon, Mich.; secretary-treasurer, Arthur L. Reagh, director of industrial arts, Grand Rapids, Mich.

♦ Dr. Verne C. Fryklund, president of Stout Institute, Menomonie, Wis., was principal speaker at the 1946 General Meeting of the Oklahoma Vocational Association. His topic was "Education as the People Want It." He was also speaker at the Industrial Education Luncheon.

Officers of the O.V.A. for 1946–47 are: president, Mrs. Annice Ashton Boyd, Chickasha, Okla.; vice-president, Lonnie Gilliland, Oklahoma City, Okla.; secretary-treasurer, Bonnie Nicholson, Stillwater, Okla. — M. J. Ruley, Tulsa, past president, 1945–46.

♦ The Miami Valley Industrial Arts Association held its first meeting since 1942, at Miami University, Oxford, Ohio, on April 20. The meeting was attended by about sixty teachers. It was voted that the association should become affiliated with the American Industrial Arts Association.

The following officers were elected: president, Bertrand Aber, head, industrial arts, Oxford Public Schools, Oxford, Ohio; secretary-treasurer, Merle D. Hartzler, instructor, industrial arts, Franklin Public Schools, Franklin, Ohio; program chairman, Eugene Robinson, director of industrial arts, Dayton Public Schools, Dayton, Ohio.

The meeting is scheduled to meet in Dayton next year. — Merle D. Hartzler, secretary-treasurer.

♦ *July 1–6.* National Education Association (summer meeting) at Buffalo, N. Y. Willard E. Givens, 1201 – 16th St. N.W., Washington 6, D. C., secretary. Headquarters, Statler Hotel.

♦ The World Congress on Air-Age Education will be held August 21 to 28 at International House, New York City, for the purpose of considering how aviation may contribute to a peaceful and united world. This congress is an outgrowth of a meeting of representatives of major educational institutions in this country and abroad who recently met in New York City to consider the problems of aviation education

(Continued on next page)

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(Please refer to this magazine in answering)

THE STANDARD ELECTRIC TIME CO., SPRINGFIELD 2, MASS.

Founded 1884

(Continued from previous page)

in peacetime. The congress is being sponsored by Air-Age Education Research in co-operation with universities and colleges throughout the country.

For further information address the Director of World Congress, Air-Age Education Research, 100 East 42nd St., New York 17, N. Y.

♦ "Printing Today and Tomorrow" was the theme for the printing section meeting of the twenty-eighth Annual Convention at the New Jersey Vocational and Arts Association, held at the Ambassador Hotel, Atlantic City, N. J., on Saturday, March 16, 1946.

Elmer E. Vosburg, assistant principal of the Murrell Dobbins Vocational School, Philadelphia, gave an outstanding address on the topic "Problems in Present Day Print Shops." His experience as a former printing instructor and his close working relations with the current problems of school and on-the-job training of veterans made the talk of special value.

Kenneth R. Harper, instructor in printing, Roosevelt Junior High School, New Brunswick, N. J., gave a chart talk on "Performance Efficiency Tests in Hand Composition."

Leslie C. Detrick, Ferris High School, Jersey City, was the presiding officer. Mr. Harper was elected printing council member of the New Jersey Vocational and Arts Association, succeeding Mr. Detrick, and will have charge of arranging the program for the 1947 printing section meeting.

Fred J. Hartman was invited to address the meeting and took the occasion to tell of the plans for the twenty-first Annual Conference on Printing Education.

Treasurer Vincent C. Coyne was elected chairman of a committee to bring together the printing teachers of the state at a meeting to be held in the near future at Newark, N. J., to reorganize the New Jersey Printing Teachers Guild. Edward O'Gorman, of the New York School of Printing, represented the New York Printing Teachers Guild at the Atlantic City meeting.

♦ The Texas Vocational Association concluded their first postwar convention at the Roosevelt Hotel in Waco, Tex., on April 20, at which time new officers were selected for the school year 1946–47.

Chris H. Groneman, professor and acting head of industrial education department, Texas A. & M. College, was elected president, and will take office effective September 1, 1946.

Chris H. Groneman, president, Texas Vocational Association

Other officers elected are: C. P. Munz, High School, Alvin, Tex., vice-president for industrial arts; and Brice Cecil, state supervisor of business education, Austin, Tex., vice-president in charge of business education. Other vice-presidents still have a tenure of one and two years.

The T.V.A. is an organization of approximately 1800 vocational teachers of agriculture, industrial arts, trades and industry, business education, vocational rehabilitation, diversified occupations, vocational guidance, and homemaking. It is an affiliate of the American Vocational Association and is one of the largest state organizations in the A.V.A.

Aubrey L. Crossland, vocational agriculture teacher of the Commerce Tex., high school, is the retiring president.

This is the second time in the history of the organization since 1922 that an industrial-arts man has been selected to its leadership.

♦ The Future Craftsmen of America are holding their annual state convention at Cass Technical High School, Detroit, Mich., on May 18, 1946, from 8:30 a.m. until 12:30 p.m.

Contests are to be:

Junior Division (Grades 7, 8, 9)
Drafting
Public Speaking
Printing
Engine Lathe Turning
Boat Building
Bench Woodworking
Wood Turning

Senior Division (Grades 10, 11, 12)
Drafting
Public Speaking
Printing
Engine Lathe Turning
Welding
Thread Cutting

Many valuable prizes are to be awarded.

The annual election of state officers will also be held at this time.

For further information concerning contests or formation of new chapters write Ted Vida, state president, F.C.A. at Cass Technical High School.

(Continued on next page)

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NATIONAL LEADERS MEET ON INDUSTRIAL TEACHER TRAINING

Through the office of Layton S. Hawkins, Chief of Trade and Industrial Education Service, United States Office of Education, Washington, D. C., a conference on Industrial Teacher Training was arranged for the first three weeks of April at the State Industrial Teacher Training School, 227 East Ninth Street, New York City, under the direction of Gilbert G. Weaver, New York State Supervisor of Industrial Teacher Training. This meeting was convened so that the leaders in the field of trade and industrial education from various parts of the country could observe the program for teacher training followed in New York State in order that these techniques, if they appeared to be appropriate, might be utilized in other parts of the country. Those in attendance were: Layton S. Hawkins, Chief of Trade and Industrial Education Service, Washington, D. C.; the directors of the four regional areas — Walton H. Cooper, western region, Nathan B. Giles, Middle West, Edward G. Ludtke, southern section, and George A. McGarvey, Atlantic States; and supervisors of industrial education — Melvin L. Barlow, California; Orville W. Connett, Illinois; William B. Connoley, West Virginia; James R. D. Eddy, Texas; Herman N. Miller, state of Washington; Joseph A. Roenigk, Ohio; J. Warren Smith, North Carolina; and Harold T. Widdowson, Minnesota.

The conference was conducted in the form of a workshop course which allowed the members of the group to actively participate in the teacher training classes. During the day they were engaged in making many types of visual aids under the guidance of experts from the various fields covered in the visual aids course. The techniques and methods of making visual aids employed by the armed forces were demonstrated and practiced. In the evening, the conference members visited the classes that comprise the curriculum set up by New York State for the certification of industrial teachers.

During the second week, visits were made to Central Needle Trades High School, Brooklyn Technical High School, Jane Addams Vocational High School for Girls, the New York Trade School, and the Bulova School of Watch Making. In each of these schools the conference group had an opportunity to observe graduates of the teacher training course teaching their respective industrial and technical subjects.

In the final week each member of the local teacher training staff met with these out-of-town directors and supervisors to discuss the procedure and methods employed in handling the various courses of the teacher training curriculum. At each of these meetings, the instructors showed how visual aids could be utilized in the teaching of these various subjects. Among those visual aids which were used for demonstration purposes were: models, mock-ups, baloptican and photographic blowups, handmade and photographic slides as well as strip and motion-picture film.

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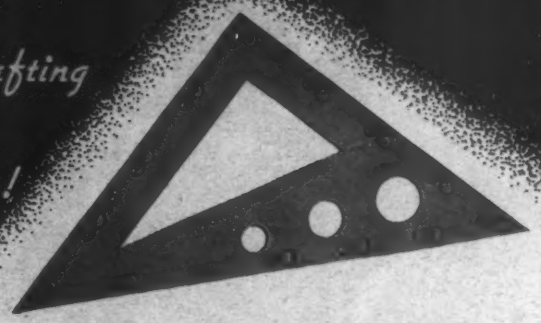

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News Notes

♦ The first peacetime conference on printing education, under the auspices of the National Graphic Arts Education Association, following World War II, will be held at the Benjamin Franklin Hotel, Philadelphia, Pa., June 13, 14, and 15, 1946.

The preliminary plans for the coming conference were laid by a special steering committee which met at the Board of Education Building, Philadelphia, on February 23, 1946.

E. E. Vosburg was named general chairman for the conference.

♦ The U. S. Department of Labor, Washington, D. C., reports that action to accelerate apprenticeship in the building trades to develop craftsmen for the Veterans Emergency Housing Program was taken in the final session of a conference of representatives of state apprenticeship agencies held during the week of March 24.

The principal recommendations which were adopted are: to encourage management-labor apprenticeship committees to advance apprentices more rapidly. This can be done by more frequent examinations of apprentices to determine ability to advance from one job skill to another. Credit for previous work and training experience should be given. Training centers should be set up where necessary to provide basic training before apprentices go on the job. It is thought that a few additional apprentices in each trade in each locality will soon add up to the requirements specified for the necessary construction jobs.

♦ Purdue University, Lafayette, Ind., whose curriculums include several aviation courses, has applied to the civil aeronautics board for permission to operate an experimental feeder air line between Chicago and Evansville, Ind. The object is to provide practical instruction for students in the special engineering course as well as to benefit aviation generally through the possible benefits of intensive research.

♦ The four top winners in the tenth Annual Essay Contest, sponsored jointly by the International Printing Ink Division of the Interchemical Corporation and the National Graphic Arts Education Association, on the topic, "Printing and World Peace," were:

Richard E. Oransky, Portland High School, Portland, Me., winner of the grand tenth anniversary prize for printed essay — $1,000 savings bond; Frank Brenner, The New York School of Printing, New York City, winner of the first prize in the regular contest — $500 savings bond; Sidney G. Simpson, School of Graphic Arts, Montreal, Canada, first place for most attractively printed essay — $100 savings bond. Also awarded second prize in regular contest — $200 savings bond.

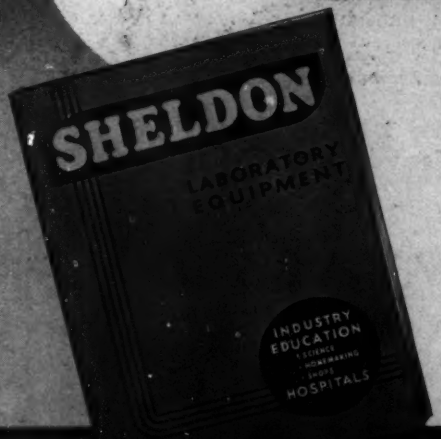
Timken Vocational High School, Canton, Ohio,

(Continued on next page)

Sheldon

VOCATIONAL EQUIPMENT

Intermediate Industrial Arts Student Bench



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(Continued from previous page)

awarded silver cup for best printed essay by printing department.

More than 6000 entrants from junior and senior high schools and vocational schools on a secondary level were entered in the contest.

♦ Elementary and secondary schools in several states have added aviation education courses to their curriculum during the 1945–46 session through the co-operation of the Aviation Education Division of the Civil Aeronautics Administration, a check by the Air Transport Association of America discloses. This brings the number of state school systems which have set up comprehensive aviation education programs with the assistance of the CAA to near the 20 mark, affecting more than one half the population of the United States. Other states are in the act of sponsoring similar programs.

♦ Wisconsin was the first state to authorize high school contracts for student flight instruction. The State Department of Public Instruction has worked out a program of four hours of flight experience to supplement classroom aviation studies. The action of Wisconsin provides a model for the enabling legislation required in many states before high school flight instruction can be given. Other states which have drawn up plans for flight experience in connection with high school aviation courses include Ohio, Alabama, California, Connecticut, Illinois, Michigan, Pennsylvania, Tennessee, Texas, and the District of Columbia.

♦ The first, and possibly still the only, high school in the nation to own its own airport is the Shelby County School of Aeronautics, Whitehaven High School, Memphis, Tenn. The landing field and parking space closely adjoins the school buildings.

♦ Four major United States flag air lines are engaged in aviation education activities and maintain special departments with full-time directors and competent research staffs and field workers, according to the Air Transport Association of America. They are School and College Service of United Air Lines, Inc.; Air-Age Education Research, American Airlines System; Aviation Education Service, Pan-American World Airways, and Educational Service, Transcontinental and Western Air, Inc. In addition, the remaining domestic air lines distribute various forms of educational literature.

♦ Something new in aviation education circles—a teacher training course which endeavors to orient the thinking of ex-service personnel along air age education lines and which emphasizes the methods of presenting aviation material to high school and college students—has been launched at Binghamton, N. Y. The course, first in a series, was started in an effort to assist schools and colleges in obtaining properly qualified teachers of aviation subjects.

♦ The American Vocational Association bulletin for the year 1934 entitled "Standards of Attainment in Industrial Arts Teaching," has been revised by a committee of 12 men and is about to be published. The name of the bulletin has been changed to "Improving Instruction in Industrial Arts." The *objectives* have been reduced in number, clarified, and coupled with specific suggestions to teachers about how to lead pupils to attain them. The number of *subjects or fields*, in which instructional units are listed, has been increased from 11 to 18.

Advance orders are being placed with L. H. Dennis, executive secretary, American Vocational Association, Inc., 1010 Vermont Ave., Washington 5, D. C. Single copies, 25 cents; five copies for a dollar, postpaid.

♦ A brochure, entitled "11 Comprehensive Services in Driver Education and Training," is being widely distributed to high school administrators and educational leaders by the American Automobile Association. This booklet illustrates the specific services and materials available to school administrators for instituting and maintaining an inclusive high school driver education and training program.

For further information write to the American Automobile Association, National Headquarters, Pennsylvania Ave. at 17th St., Washington 6, D. C.

♦ Thirty-two tuition scholarships at the Universities of Chicago and Wisconsin and at Indiana University have been established by Encyclopaedia Britannica Films, for teachers to study audio-visual motion picture teaching techniques.

Announcement of the scholarships was made by H. R. Lissack, vice-president of the film company. The scholarships will be for the 1946 summer term at the three universities, and all teachers or school administrators whose work gives them special responsibilities for audio-visual instruction, are eligible to apply.

Twelve scholarships are to be awarded for the University of Chicago summer session, and interested teachers or administrators should apply, stating their qualifications, directly to Dr. Stephen M. Corey, University of Chicago Center for the Study of Audio-Visual Instructional Materials, 5835 Kimbark Ave., Chicago 37, Ill.

The University of Wisconsin will give out 10 scholarships. Dr. Walter A. Wittich, director, Bureau of Visual Instruction, University Extension Division, Madison 6, Wis., is in charge of selecting candidates.

The ten Encyclopaedia Britannica Films scholarship winners at Indiana University will be picked by L. C. Larson, consultant in audio-visual aids, Bureau of Audio-Visual Aids, Bloomington, Ind.

♦ The State of Nebraska Aviation Education program, although set up only five years ago, is recognized as one of the most outstanding projects of its type in the nation. Today more than 100 high schools in that state reportedly offer courses in preflight aeronautics, and numerous other schools offer a social studies course in aviation.

♦ New York University has established the first working and research graduate scholarship in the highly specialized field of air freight.

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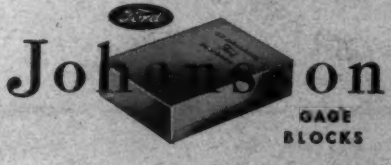

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Shop Equipment News

New Products—Publications

DOALL'S NEW HIGH SPEED METAL SAW

The Zephyr 16, high speed metal cutting bandsaw, has just been announced by The DoAll Company.

Designed primarily for light gauge steel and foundry application, the Zephyr 16 is also applicable to woodworking and pattern shops, and wherever it is desired to cut material as fast as it can be fed into the saw.

The saw has a 16-in. throat depth and a 10-in. thickness capacity. Equipped with the company's patented speed assembly, the machine has a variable speed range from 1000 to 5000 f.p.m.

Zephyr 16, bandsaw

The combination of controlled saw speed and the special DoAll saw blade make very fast cutting rates possible in sheet steel, aluminum, and ferrous and nonferrous castings as well as paper, wood, plastics, laminates, and composition materials. Steel springs and links, flexible steel tubing, laminated rubber and steel, or aluminum and wood, combinations of steel and copper, steel and rubber tubing, or porcelain steel can all be sawed on the Zephyr 16 with speed and good finish.

The table of the Zephyr 16 is of the tilting type, and there is a disk cutting attachment for making perfect circles, a rip fence, and a mitering attachment for cutting of regular and compound angles. Hardened steel saw guides with roller backup bearing hold the blade firm for straight true cuts to close tolerance.

Full information on the Zephyr 16 is contained in the Zephyr catalog obtainable from The DoAll Company, 1301 Washington Ave., South, Minneapolis 4, Minn.

For brief reference use IAVE—1510.

CABINET FOR PORTABLE SHAPER

The convenience and economy of being able to move an AMMCO 7-in. shaper quickly from job to job is offered in a new portable cabinet on which the shaper can be mounted.

The cabinet is provided with casters and a folding handle which compactly drops out of the way when not being used. All four legs rest firmly on the floor when the cabinet is not in moving position. The cabinet is made of selected maple with natural varnish finish. It has two storage spaces and a large drawer for tools and accessories.

Important in the economy found in the small shaper is the time saved in quick setup. Wheeling the machine to the job, to the workman's bench, or wherever it is wanted, saves steps and time for the shop. Valuable, too, is the saving on floor and bench space when the cabinet is stored out of the way when not in use.

Portable cabinet for 7-in. shaper

Manufactured by Automotive Maintenance Machinery Company, 2100 Commonwealth Avenue, North Chicago, Ill.

For brief reference use IAVE—1511.

THE NEW BRADLEY WASHFOUNTAIN

The Bradley Washfountain Co. of Milwaukee, Wis., has added the new DUO Model to its popular line of washfountains.

This is a two-person fixture for general use in washrooms of small plants, offices, engineering and drafting departments, schools, institutions, department stores, railroad and bus stations,

Bradley DUO model washfountain

airports, super gasoline stations, food marts, and other public buildings.

The new DUO-Washfountain has the Bradley sprayhead instead of faucets. This feature enables two persons to be served at the same time and consequently the one sprayhead replaces four faucets. This fixture reduces the number of piping connections, saves space, and simplifies maintenance. A convenient foot treadle controls spray and the self-flushing deep bowl prevents any collection of contaminated water. The bowl is furnished either in stainless steel or white enamel iron with similarly finished pedestal panel that encloses the connections and mixer.

For brief reference use IAVE—1512.

(Continued on page 28A)

Something Old, Something New...

"Something New" — the delicacy of detail, the laciness of texture, revealed in this illustration of a bride, done in Higgins American India Ink by Mary Gibbs for "The Bride's Magazine."

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(Continued from page 26A)

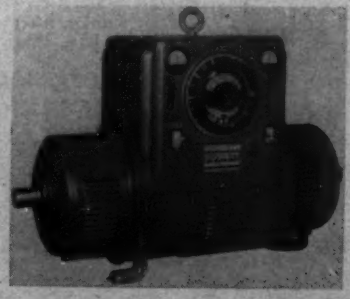
SYNCHRONOUS MOTOR WELDER

By utilizing the inbuilt separate exciter of The Hobart Electric Drive Welder, The Hobart Brothers Company, Troy, Ohio, has produced a compact, high performing Synchronous Motor Welder. The unit is so proportioned that it can be started across the line and automatically synchronizes itself by the build-up of the separate exciter. The starting current on this unit is approximately the same as a conventional induction motor of the same horsepower capacity.

This machine can also be used as an a.c. generator for the operation of small tools, lathes, grinders, etc. This is done by coupling the shaft to a gasoline or electric motor and the synchronous motor then becomes an a.c. generator.

The Motor Generator Corp., Division of The Hobart Brothers Co., Troy, Ohio, has just placed on the market a new automatic motor generator set for direct current charging of motorized lift truck batteries in either lead-acid or nickel-iron types.

The generator is a 15–16 volt, d.c. 50 ampere, ¾ KW diverter pole type, conservatively rated and built as an integral unit with a 3-phase, a.c. 220/440 volt, 60 cycle, 1½ h.p. squirrel cage induction, ball-bearing motor.



Synchronous motor welder
— Courtesy, Hobart Brothers Co., Troy, Ohio

A d'Arsonval type ammeter to indicate the rate of charge, slide fixed resistance coil, a magnetic motor starting switch, automatic reverse current cutout and interval timer are housed in the control cabinet.

Battery charger

One 10-ft. length of 3-conductor power cable and one 6-ft. length of 2-conductor battery charging cable are furnished with the machine. As illustrated, this makes possible the charging of batteries without lifting them from the truck.

This ¾ KW fully automatic machine is designed for the Modified Constant Voltage charging of one 6-cell 250 ampere hour battery in eight hours. Special models are available for all types and sizes of batteries — in either one, two, or four battery circuits.

For brief reference use IAVE—1513.

WESTON BROAD-RANGE ANALYZER

A new lightweight, compact, broad-range analyzer has been announced by the Weston Electrical Instrument Corp., Newark, N. J.

In spite of its small size (6⅜ by 9⅛ in.), the Weston model 779 has five completely over-

Broad-range analyzer

lapping a.c. and d.c. voltage ranges, seven d.c. current ranges, four d.c. resistance ranges, and five decibel ranges. Each range has been selected for maximum adaptability to all requirements of electronic testing and maintenance. Each d.c. voltage range is available at a dual sensitivity of 1000 or 20,000 ohms per volt.

The model 779 is mounted on a solid molded bakelite panel in an oak carrying case. All readings are taken on a standard 4-in. rectangular 50 microampere instrument and a.c. measure-

(Continued on next page)

(Continued from previous page)

ments are made possible through a special temperature-compensated full-bridge copper oxide rectifier so designed that all a.c. readings are made on a single scale arc.

This unit is ideal for field maintenance or shop testing of all types of commercial or industrial electronic equipment. The 20,000 ohm per volt d.c. sensitivity is particularly suited to the measurement of potentials in the high resistance circuits now encountered in electronic receivers, transmitters, communications equipment, cathode ray units, electronic timers, and machinery controls, dielectric heating units, and all other associated electronic devices.

For brief reference use IAVE—1514.

RADIUS GRINDING ATTACHMENT

A new No. 2 radius grinding attachment, for use on Cincinnati No. 2 cutter and tool grinders, has been recently announced by The Cincinnati Milling Machine Co. This attachment will grind 0 to 1-in. radii on cutters from 4 to 12 in. in diameter, having flute lengths up to 3 in.

Radius grinding attachment

Adjustment to the desired radius is obtained through a micrometer gauge which has a range of 1 in., and pivots 90 deg. to positive stops. Zero reading in both positions indicate that the junction between the face and diameter of the cutter will swivel directly above the center of the pivot; or in other words, zero radius will be obtained. From this setting, the cutter may be accurately offset, through two adjustable slides, to the desired radius, as indicated by the direct reading micrometer.

Monoset cutter and tool grinder

Both slides, which carry the cutter mounting assembly, can be independently operated by a crank and screw, each equipped with a micrometer dial, graduated to read in thousandths of an inch. The complete upper part of the unit swivels on a large antifriction trunion, adjustable for wear. Adjustable positive stops are provided to limit the swing to 90 deg.

The standard workhead supplied with Cincinnati No. 2 cutter and tool grinders is used in conjunction with this attachment. For complete catalog data, including setup hints, write to The Cincinnati Milling Machine Co., Cincinnati 9, Ohio, for their publication No. M-1442.

This firm also has improved its Monoset cutter and tool grinder. While the basic principles of operation have been retained, the machine has been completely redesigned.

For brief reference use IAVE—1515.

SHELDON Precision Lathes

Have you seen the new SHELDON Lathes...

...those built in the new SHELDON machine tool plant? Always good lathes, these new SHELDONS are even better, not only in design refinements but in extreme accuracy, greater work capacity for size, "sweeter" handling and actual beauty of finish. Only a set-up like the new SHELDON plant could build such lathes—a specially designed building, the most modern manufacturing methods, complete tooling with row on row of the finest, most modern manufacturing equipment.

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NEW KEARNEY AND TRECKER CATALOG

A 48-page general catalog has just been released by the Kearney & Trecker Corporation, Milwaukee 14, Wis.

The catalog devotes six pages to a short history of the company and its products, and the balance to a concise presentation of its entire line of milling machines, boring and milling machines, and their accessories and allied products. Specifications of all machines, including both English and metric descriptions, are presented in fine-line drawings and two color tables.

For brief reference use IAVE—1516.

DISTRIBUTORS OF INSTRUMASTER PRODUCTS

John R. Cassell Co., Inc., 110 W. 42nd St., New York 18, N. Y., has been appointed exclusive manufacturer's distributor in the United States and Canada for the "Instrumaster" line of mechanical drawing accessories made by Instrumaster Industries, Inc., 73 Arch St., Greenwich, Conn.

Prominent in the line is the "Instrumaster" Isometric stencil, the "Instrumaster" Hatching stencil, and "Instrumaster" Floating Triangles.

For brief reference use IAVE—1517.

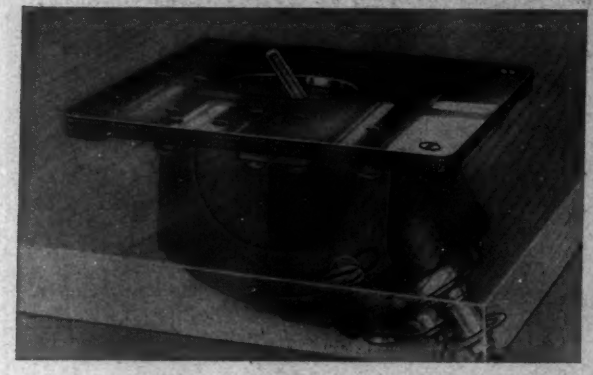
SELECTION OF ARC WELDING ELECTRODES

"Arc Welding Electrodes," a new 32-page illustrated catalog published by Wilson Welder & Metals Co., Inc., is designed to guide electrode users in the selection of the right electrodes for any specific job.

This catalog supplies complete data on the proper electrodes to be used for all types of work on a wide variety of base metals, and describes the approved welding procedures for each application.

(Continued on next page)

MAKE your RS4A HAND SHAPER into a BENCH SHAPER that turns out professional quality mouldings and decorative furniture edges



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(Continued from previous page)

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Chemical analyses, specifications, and other engineering data are supplied for each electrode.

Copies of this booklet may be obtained from Wilson Welder & Metals Co., 60 East 42nd St., New York 17, N. Y., or from the nearest Wilson distributor.

For brief reference use IAVE—1518

PIONEER DIES

John J. O'Brien, founder and retired chairman of the board of the South Bend Lathe Works, South Bend, Ind., died on April 24, 1946.

Mr. O'Brien was deeply interested in the educational value of his product. Just to mention one of his efforts to help the student, the little text, "How to Run a Lathe," which his firm distributed gratis to schools already has exceeded one million copies.

New Publications

Guide to Guidance, Vol. VIII

Edited by M. Eunice Hilton. Price, $1, postpaid, 58 pp. Published by Syracuse University Press, Syracuse, N. Y.

This issue of *Guide to Guidance* continues the series of annotated bibliographies on guidance which was begun in 1939 by the National Association of Deans of Women of the N.E.A.

The 1946 edition is a selected bibliography of articles and books on guidance published in 1945. The annotations are brief and to the point, but give sufficient information so that the reader can make a selection that is useful for a specific purpose. It is a handy reference book and time-saver for the person seeking materials that apply to selected problems.

Simplified Punch and Diemaking

By James Walker and Carl C. Taylor. Cloth, 235 pp., 5¼ by 8⅝ in., illus., $5. The Macmillan Co., New York City.

This book should be of great interest to those interested in machine tool design as well as those who work in the toolroom making punches, dies, and special production tools.

It is a book that will be helpful to the mechanic as well as to the apprentice. It describes the various types of dies, how to lay them out, shows how blanking dies are constructed, discusses progressive dies, bending and forming dies, drawing dies, and presents a chapter on a manufacturing problem and its solution.

The book contains a glossary, and some very helpful tables and charts.

The Green Book of Stenciling with Handmade Tools

By William Anderson. Paper, 16⅞ by 10¼ in. Published by Fellowcrafters, Inc., Boston, Mass.

This book contains 27 plates of excellent full-size stencil designs which can be used singly or in combination with others to make interesting decorations for many uses. The plates present stencil problems running from the very simplest to those that are quite difficult. All of them, however, are pleasing and usable for many decorative purposes.

Each plate is accompanied by clear and concise directions.

Time Study and Motion Economy

By Robert Lee Morrow, M.E. Cloth, 337 pp., 6⅜ by 9¼ in., illus., $5. Published by The Ronald Press Co., New York City.

A very thorough book on this very important method of helping the worker do more with less effort. The equipment needed and the procedures to be employed in applying it in gathering needed data, are all clearly explained.

The organization and training of the time-study personnel together with the acquiring of employee-union-management co-operation also is explained and discussed.

Applications to such problems as feeds and speeds for metal cutting are given as examples that have been worked out.

How to Find and Succeed in Your Post-War Job

By Frank S. Endicott. Cloth, 147 pp., 5⅛ by 8¾ in., illus. Published by International Textbook Co., Scranton, Pa.

A book of advice for the young people who must now go out and find a job. The author clearly shows the reader how to apply the advice given in the book, how to discover what his stock in trade is, how to evaluate what jobs require, and what they have to offer, how to obtain additional counsel when needed, how to plan the job-seeking campaign, how to get the job, and then how to succeed in it.

Publishing for Pleasure & Profit

By Walter Buchler. Cloth, 48 pp., 4⅞ by 7⅜ in., price, 3*s.* 6*d.* Published by Useful Publications, 37, Aldwych, London, W.C.2, England.

A very interesting and instructive book in which the author gives intimate details of his own entry and experiences in the field of publishing.

The author also gives excellent advice to authors, describing in detail how he went about writing several books and then publishing and selling them. Probably some of his methods of advertising, such as pasting selected abstracts of reviews from some of his other books, on the free spaces at the end of chapters in the book he was sending to a purchaser, would not be favored in America.

Science Year Book of 1945

By John D. Ratcliff. Cloth, 224 pp., 5¼ by 8 in., $2.50. Doubleday, Doran, New York City.

A book in which the outstanding discoveries of the year 1945, in the fields of medicine, physics and chemistry, aviation, and other sciences are interestingly presented in clearly understandable, nontechnical language.

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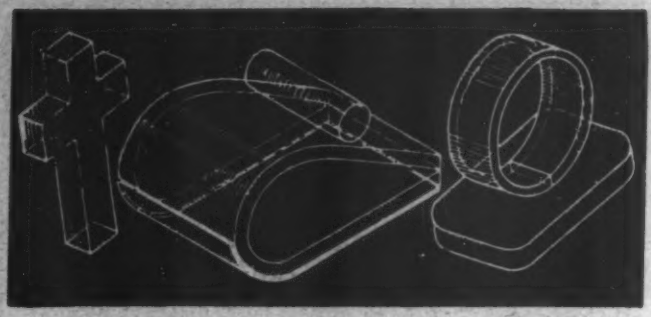

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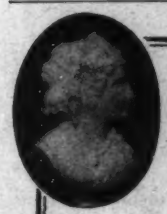

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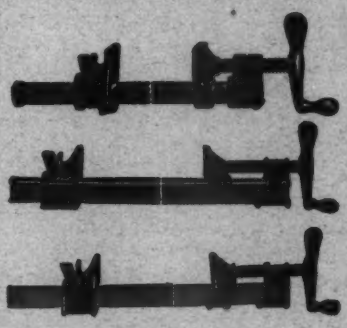

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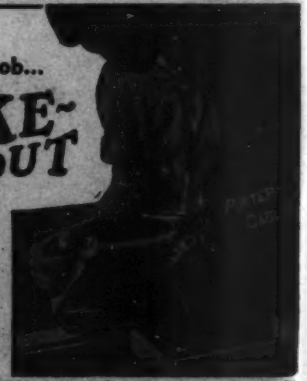

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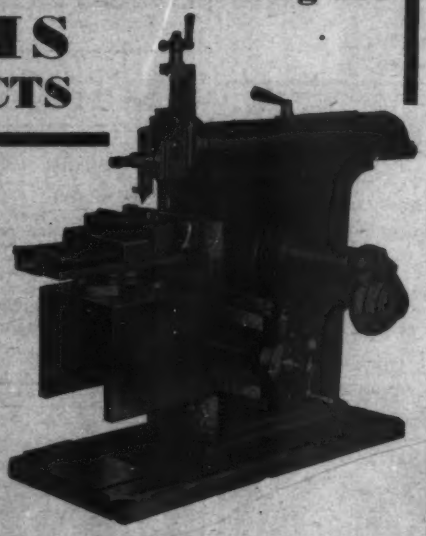

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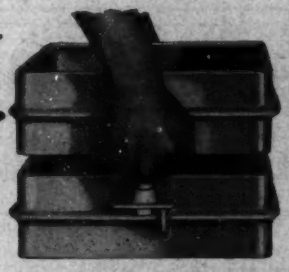

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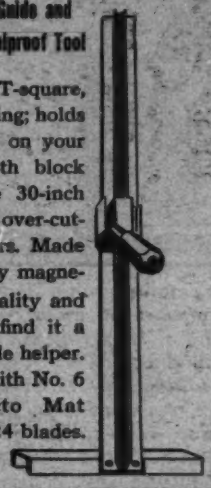

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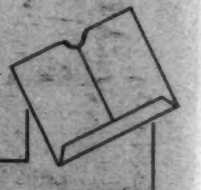

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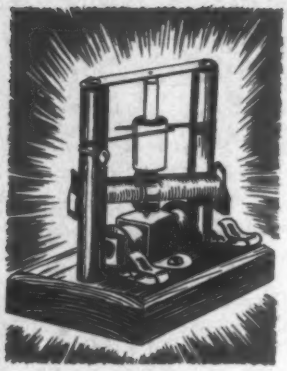

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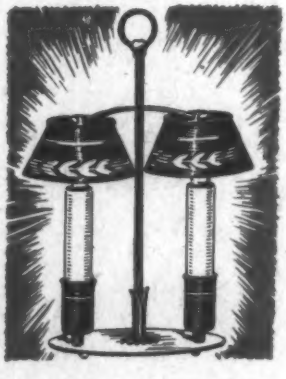

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